

# METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

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## COMING SOON

The January, 1953 issue of Metal Finishing will be our 50th Anniversary number and will contain several articles covering the past fifty years in the plating and finishing industry, in addition to its regular monthly features.

Detailed information on lead plating processes and their application.

An article describing factors in spray-silvering developed for use in electrotyping.

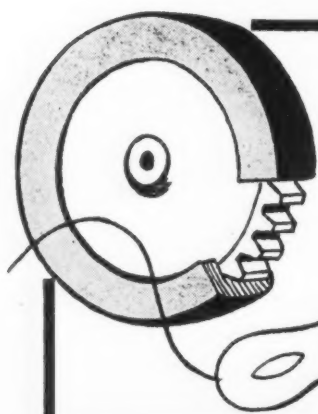
The methods and treatment facilities used to protect a city sewage system from harmful effects of wastes.



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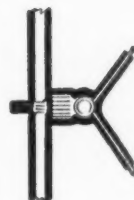


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# The WASHINGTON OBSERVER



Charles A. Cerami

## News and Views from The Nation's Capitol

. Soon after Henry H. Fowler, head of the Office of Defense Mobilization, called upon Government agencies to try to increase available supplies of critical metals, particularly nickel, the Defense Materials Procurement Administration signed contracts with Milnet Mines and Falconbridge Nickel Mines, both of Toronto. The former company will start mining not later than next March first and will produce ore at an average rate of 2,100 tons per week to the end of 1954, which will be processed by Falconbridge in its plants in Canada and Norway. To expedite matters, the Export-Import Bank established a \$5 million credit for Falconbridge, which is the world's second largest nickel producer. The company is slated to deliver a total of not less than 50,000,000 lbs. of metal to the Government by 1961, and has an option to deliver an additional 25,000,000 lbs. of nickel and copper. When this metal starts rolling in the nickel situation should ease considerably for platers.

. Distribution of an additional 1,480,000 tons of carbon steel products was approved by DPA for the first quarter of 1953 on the advice of its Steel Products Industry Advisory Committee. If production picks up, there may be another supplemental distribution for first quarter use.

. Defense Production Administration expansion goals call for an annual capacity of 180,000,000 lbs. of perchlorethylene by the end of 1954. This represents an expansion of 75,000,000 lbs. over the capacity on January 1, 1951. The agency also announced, among chemicals most rapidly easing, copper chemicals, sodium cyanide, hydrogen peroxide, zinc chloride and zinc ammonium chloride.

. As a whole, the 1953 outlook for aluminum is optimistic. The British Government and The Aluminum Company of Canada have agreed to an arrangement which will supply this country with an additional 77,000,000 lbs. for delivery during December and the first two quarters of 1953, which is double what had been promised. Although power shortages due to drought in the producing areas cut domestic production more than 16 million pounds in September, as compared with August, the third quarter's output exceeded the second quarter's by 2.2 per cent. Copper is in delicate balance and, although a slight improvement in nickel availability is expected next year, decontrol of nickel usage is not in sight, according to NPA.

. Metallurgists of the Bureau of Mines have produced a highly refined chromium, malleable enough to be forged at extremely low temperatures. The metal is produced by refining electrolytic chromium in a hydrogen atmosphere at high temperature.

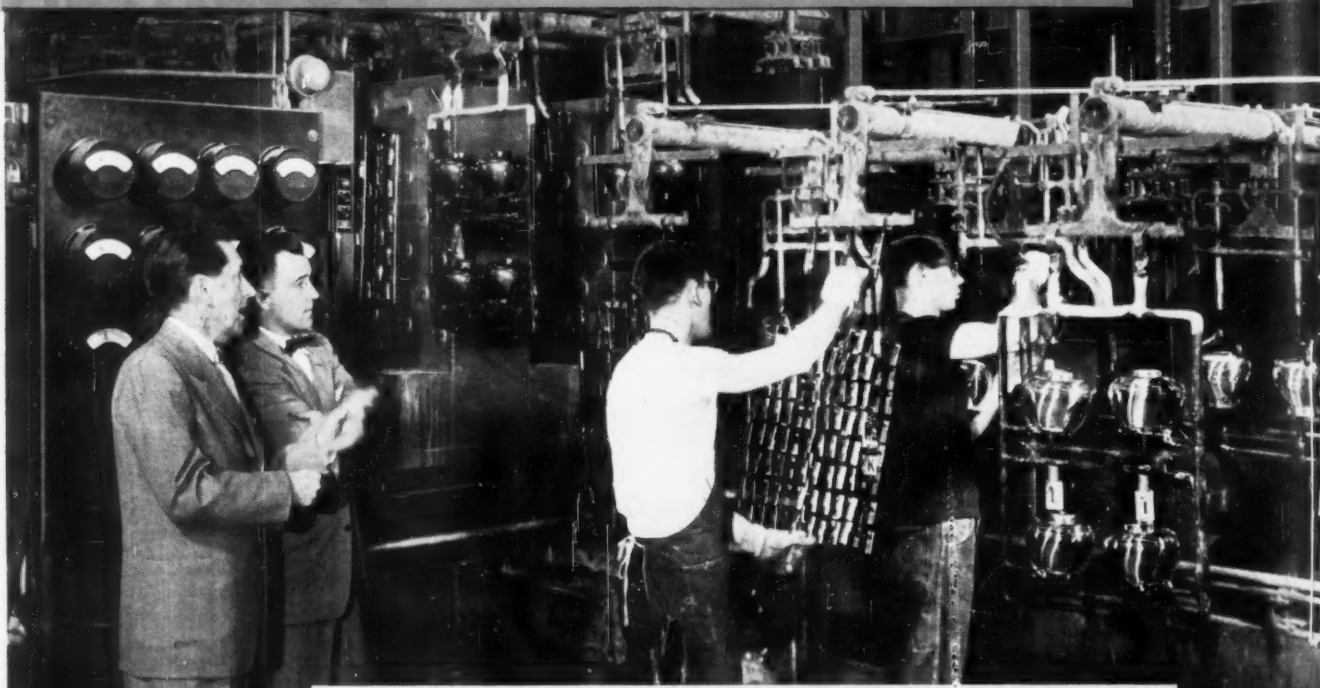
. Long-range plans to tackle the nation's problems of distribution costs in order to lower consumer prices were outlined formally recently by H. B. McCoy of the newly formed Office of Distribution, U. S. Department of Commerce.

. Field offices of either the Small Defense Plants Administration or the U. S. Department of Commerce will furnish, for the asking, copies of a pamphlet on Subcontracting for Small Plants, issued in October. It has some good information on where to look for subcontract opportunities.

. Manufacturers have been authorized to accept unrated orders for foreign MRO items in excess of export quotas established under Order M-79. Other NPA orders give users of controlled materials the option of maintaining inventories on a class or item basis (CMP Regulation 2 Amended) and establish basic rules of the priorities system in revised form.

. Approximately \$160 million of defense work has been earmarked exclusively for small business, according to John E. Horne, Administrator of the Small Defense Plants Administration.

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# METAL FINISHING

## LOOKING BACK

This issue of METAL FINISHING is not only the last one of the year but the issue which closes Volume 50. Next month we celebrate our fiftieth anniversary and mark the milestone of a half century of progress and service to the industry.

Ordinarily we would look back over the past year and note the developments we have been privileged to bring to the attention of our readers but the occasion calls for a glance much further back. Back to the beginning of the century when litmus paper was considered an advanced method of controlling nickel plating solutions, a marked improvement over dependence on the sense of taste. Back to the time when the atom was the smallest known form of matter and platers looked askance at chemical equations.

Early in the century George B. Hogaboom made history by employing chemical analysis for plating room control purposes — now the atom has been disintegrated and, during the present year, we have published articles like the one in this issue describing *radioactivity* as an established analytical tool for evaluating metal finishing processes. From litmus paper to vacuum tube-amplified pH meters, from burettes to spectrophotometers — we certainly have moved forward.

On the other hand, how many of the developments we consider fairly recent should be credited to the distant past? Periodic reverse goes back 28 years to Alfred Holt, phosphating 45 years to Coslett, brightener 105 years to Milward. It makes one marvel at the results produced back in the early days, especially with the rather primitive tools available and lack of information at the time. It also makes one regret that more of the "old timers" couldn't be around to see what we are doing today.

*Nathaniel Hall*

## Metal Finishing

Wishes You A Very Merry Christmas and A  
Happy and Prosperous New Year



# Radiometric Evaluation of the Effectiveness of the Chromic Acid Rinse Treatment for Phosphated Work\*

By Stanley L. Eisler and Jodie Doss\*\*

## Abstract

**R**ADIOMETRIC and supplementary salt spray tests were conducted using several solutions of varying concentrations of chromic acid and chromic-phosphoric acid (1:1). Results indicated that:

- (1) The presence of phosphoric acid in the rinse solution improves the rate of adsorption.
- (2) The optimum concentration for the rinse solution is 30 oz.  $\text{CrO}_3$  per 100 gal. or 16 oz.  $\text{CrO}_3$  plus 16 oz.  $\text{H}_3\text{PO}_4$  per 100 gal.
- (3) The pH of the solution should be maintained as close to a value of 2 as possible.
- (4) The amount of chromic acid adsorbed varied with the chromic acid content of the solution although not proportionately.

## Introduction

The use of a final chromic acid rinse in the phosphating procedure is covered by at least two early patents.<sup>1,2</sup> The purpose of the chromic acid rinse, as mentioned in the two above patents, was to decrease the deleterious effect of entrained molecules of the accelerators used in the phosphating bath. These entrained molecules were found to promote the formation of blisters under paint or other subsequently applied coatings.

The use of the chromic acid rinse has become common practice in industry today for the purpose noted above and to impart additional corrosion protection to the phosphated work.<sup>3,4</sup> Douty<sup>3</sup> also mentions that salts in untreated tap water may leave objectionable paint blistering and paint shedding residues. However, he states that these residues are destroyed by the addition of the proper amounts of chromic or chromic-phosphoric acids to the final rinse bath.

The mechanism whereby the chromic acid rinse enhances the corrosion prevention of the protective film, according to Evans,<sup>5</sup> is to repair the original air-formed iron-oxide film at any weak places with a mixture of ferric and chromic oxides. This reference applies to enhancing the protection of bare steel, but also would apply to phosphated surfaces where there are many pores in the coatings through which the bare

steel is exposed. Darrin<sup>6</sup> states that there is another action of the chromate which precedes the formation of the ferric-chromic oxides and which he identifies as a change in the nature of the metal surface which may be either force or molecular in nature.

This investigation was undertaken to determine the amount of chromic acid adsorbed on phosphated work, using solutions of various concentrations, and to relate this data to the enhancement of the corrosion resistance. Based on the results obtained, it was planned to recommend an optimum concentration for the chromic acid rinse solution. The use of radiometric techniques was deemed necessary, due to the inadequacy of gravimetric procedures to measure such small amounts of adsorbed material.

## Preparation of Radioactive Tracer

The radiochromium used for this investigation was purchased from the Oak Ridge National Laboratory by authorization of the Atomic Energy Commission, Isotopes Division. It was received as chromic chloride in weak HCl solution and possessed a specific activity of 349.3 millicuries per gram.

The 3.6 ml. of solution contained in the shipment from Oak Ridge was diluted to 25 ml. which provided an activity of 0.8 millicuries per milliliter as of the date of assay prior to shipment. A 10 ml. portion of this solution was made alkaline with ammonium hydroxide and then oxidized with hydrogen peroxide to convert all the chromium to the hexavalent state. The excess ammonia and hydrogen peroxide were then removed by heating. The ammonium ion was removed from the solution by passing the diluted solution through a small ion exchange column containing Rohm & Haas IR-120 cationic resin. The resultant effluent, consisting of the chromic acid and chloride ions, and the water used for rinsing the column, was evaporated to 100 ml. which hereafter is identified as the stock solution.

A preliminary test was conducted to determine the techniques and equipment required for efficient counting of the  $\text{Cr}^{51}$  in the stock solution. It was anticipated that considerable difficulty would be encountered since  $\text{Cr}^{51}$  decays by K-capture which results in a very weak X-ray being released for detection purposes. The solution for the preliminary test contained 12.5 ml. of the stock solution and additional normal  $\text{CrO}_3$  to give a concentration of 1.179 g./L. of  $\text{CrO}_3$ .

\*The opinions or assertions contained herein are not to be construed as being official or reflecting the views of the Department of the Army.

\*\*Radiochemist and Chemist, respectively, Ordnance Corps, Rock Island Arsenal, Rock Island, Illinois.



Phosphated coupons were coated by pipetting 0.01 ml. of the above test solution on the face of the coupon. These coupons were then counted using a TGC-2 Geiger-Muller mica window tube (Helium fill gas), but the counting rates were so extremely low that this type of counting was abandoned. The use of a windowless counter was tried next and much higher counting rates were obtained but poor reproducibility resulted. The next method employed was the use of a TGC-3 Geiger-Muller mica window tube (Argon fill gas) which provided sufficiently high counting rates and much better reproducibility. Therefore, in all subsequent tests all counting was done by centering the coupons on an aluminum plate so that the face of the coupon was approximately 5 mm from the window of the TGC-3 tube.

### Adsorption of Chromic Acid

The basic plan for the measurement of the amount of chromic acid adsorbed on phosphated work involved the comparison of the counting rates of coupons upon which had been placed a definite volume of the test solution with coupons rinsed in the test solution for one minute in accordance with current shop practice.

The coupons used were circular discs made of S.A.E. 1020 steel and were 0.975" in diameter and  $\frac{1}{16}$ " thick. A 0.073" hole was drilled  $\frac{1}{16}$ " from the coupon edge for ease of handling with wire hooks.

Four solutions of varying chromic acid content and four solutions of varying chromic-phosphoric (1:1) acid content were prepared for the original phase of the investigation. The concentrations were set to be equal to 0.5, 1.0, 1.5 and 2.0 times the shop solution concentrations (i.e., solutions 2 and 6). The starting concentrations of the eight solutions which were made up in 200 ml. volumes are shown in Table I. Each solution contained 3 ml. of radioactive stock solution. Solutions 1 to 4 inclusive contained chromic acid only, while solutions 5 to 8 inclusive contained both chromic and phosphoric acids.

TABLE I  
Concentration of Test Solutions

Solution No.	Oz./gal. CrO <sub>3</sub>	Oz./gal. H <sub>3</sub> PO <sub>4</sub>	g./L. CrO <sub>3</sub>	g./L. H <sub>3</sub> PO <sub>4</sub>
1	.0375		.281	
2	.075*		.562	
3	.1125		.844	
4	.150		1.125	
5	.02	.02	.150	.150
6	.04*	.04*	.300	.300
7	.06	.06	.450	.450
8	.08	.08	.600	.600

\*Indicates concentration of currently used shop solutions.

The coupons were prepared for phosphating by degreasing in a trichloroethylene vapor degreaser and then sandblasting. The coupons were cleaned after sandblasting by spraying with cold V. M. & P. naphtha and rinsing in hot naphtha and hot methanol.

Prior to phosphating, all coupons which were to be processed in the test solutions were coated on the back with Minnesota Mining & Mfg. Co. plastic coating EC-925. This step was considered necessary so that

any activity on the backs of the coupons would be removed by stripping the coating after the chromic acid rinse operation. This precluded any possibility of counting radiation from any part of the coupon other than the face of the coupon, thus providing a definite area for comparison with the controls. Control coupons were not coated with the plastic coating.

One set of coupons was phosphated for thirty minutes in a nitrate-accelerated, zinc-base, phosphating bath at 200 — 210°F. to produce the zinc phosphate coating. A second set was phosphated for forty-five minutes in a manganese-base phosphating bath at the above temperature to produce the manganese phosphate coating. After phosphating, the coupons were rinsed in tap water and dried. All phosphating was done in the Arsenal shop tanks.

After phosphating, the coupons were returned to the laboratory. Three control coupons were prepared for both types of coating and for each of the eight test solutions by pipetting 0.05 ml. of the test solution on the face of the coupon. These coupons were then dried under an infra-red lamp prior to counting.

Five test coupons were prepared for each type of coating and for each of the test solutions. The procedure involved immersing the coupons in the test solution maintained at a temperature of 200-210°F. for one minute. Immediately after removal from the rinse solutions, the coupons were air blown until dry. The plastic coating was then removed from the backs as previously mentioned.

Control and test coupons were then counted using the procedure previously described. A total of 640 or 1280 counts were totalized for each coupon and background counts were made for a total of 128 counts. The average net counting rates for each group of three control coupons and each group of five test coupons were determined from the counting times. A ratio was then determined by dividing the average net counting rate of the test coupons by the average net counting rate of the similar control coupons.

Based on the ratios determined and the solution concentration, the grams of chromic acid adsorbed per square foot was determined by use of the following formula:

$$\text{Ratio} \times \text{Concentration (oz./gal.) CrO}_3 \times 0.0722 = \text{grams/ft.}^2 \text{ CrO}_3 \text{ adsorbed.}$$

This formula was derived as follows:

$$\text{oz./gal.} \times 7.5 = \text{g./L.}$$

$$\text{g./L.} \div 20000 = \text{g./0.05 ml. (in control)}$$

$$\text{g./0.05 ml.} \times \text{Ratio} = \text{grams adsorbed on coupon}$$

$$\text{Area of coupon} = 0.747 \text{ sq. in.}$$

$$144 \div 0.747 = 192.771 \text{ coupons/sq. ft.}$$

$$\text{oz./gal.} \times R \times \frac{(7.5 \times 192.771)}{20000} = \text{g./ft.}^2 \text{ or}$$

$$\text{oz./gal.} \times R \times 0.0722 = \text{g./ft.}^2$$

It was found during the first tests that there was a wide variance in the counting rates of the controls prepared on the manganese-base phosphate coatings. This was attributed to the greater ease with which the solutions wet these coupons, and as a result some of the

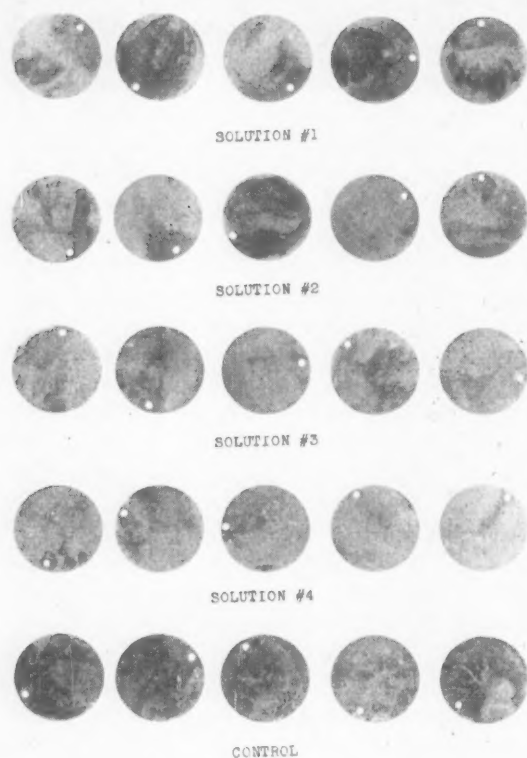


Figure 1. Salt spray test after chromic acid rinse.

test solution was lost by run-off over the edge of the coupons. As a result of this difficulty, it was decided to use only controls prepared on zinc-base phosphated coupons for subsequent tests. It was believed that any error introduced by this change would be of minor significance.

The results of four identical tests, conducted as described above, are presented in Table II. The following conclusions may be drawn from the data in Table II:

TABLE II  
Adsorption of Chromic Acid

Grams  $\text{CrO}_3 \times 10^{-3}/\text{ft.}^2$

Solution No.	Test #3	Test #4	Test #5	Test #6	Average
<i>Zinc Phosphated Coating</i>					
1	2.79	5.18*	3.22	2.86	2.96
2	5.00	8.68*	6.04	5.45	5.50
3	8.58	9.35	9.49	7.39	8.70
4	7.76	10.14	8.66	8.42	8.74
5	2.22	3.38	4.50	2.60	3.18
6	4.52	6.04	5.77	5.30	5.41
7	6.50	9.25	6.98	9.78	8.13
8	6.35	9.63	13.43	10.20	9.90
<i>Manganese Phosphate Coating</i>					
1	32.27*	6.53	4.08	4.97	5.19
2	47.85*	9.73	6.11	5.46	7.10
3	32.25*	8.96	8.14	6.19	7.76
4	22.97*	8.69	3.80	7.32	8.27
5	14.15*	4.90	4.80	3.86	4.52
6	35.63*	5.97	5.68	5.10	5.58
7	30.56*	8.44	7.40	7.55	7.80
8	16.52*	8.03	11.44	6.74	8.64

\*Indicates results omitted from average.

1. The amount of chromic acid adsorbed increased with the concentration of  $\text{CrO}_3$  in the rinse solution although not proportionately.

2. The amount of chromic acid adsorbed is increased by the presence of phosphoric acid. This is shown by comparing the results obtained with solutions 1 and 6, or 2 and 8, wherein the chromic acid contents are approximately equal. This is particularly noticeable in the case of zinc phosphate coatings.

3. The results for the manganese phosphate coated coupons in test 3 were all discarded as not being representative when compared with the results of the other three tests. This was attributed to the fact that a very poor phosphate coating was obtained on that series (as evidenced by rust formation under normal atmospheric conditions). The extremely high amount of chromic acid adsorbed is substantiated by the theory of Evans<sup>5</sup> which states that if the film is highly discontinuous, more chromic oxide will be deposited in the process of repairing the film.

Salt spray corrosion tests were conducted on zinc phosphate coated coupons rinsed in the various rinse solutions at this point in the investigation. The results of these tests will be covered in the next section of this report. Since the optimum in corrosion resistance had not yet been attained, based on the salt spray test results, it was decided to run adsorption tests at higher concentration levels.

Four solutions were prepared as follows:

Solution 4a — 0.30 oz./gal.  $\text{CrO}_3$

Solution 4b — 0.60 oz./gal.  $\text{CrO}_3$

Solution 8a — 0.16 oz./gal.  $\text{CrO}_3$  and  
0.16 oz./gal.  $\text{H}_3\text{PO}_4$

Solution 8b — 0.32 oz./gal.  $\text{CrO}_3$  and  
0.32 oz./gal.  $\text{H}_3\text{PO}_4$

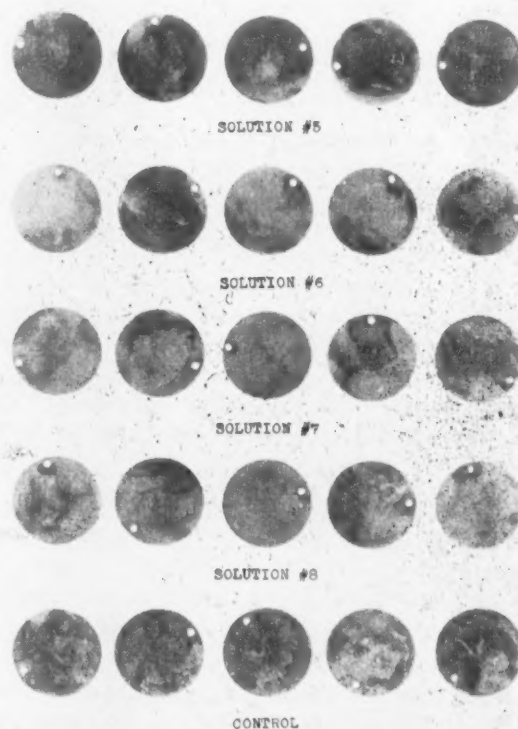


Figure 2. Salt spray test after chromic-phosphoric acid rinse.

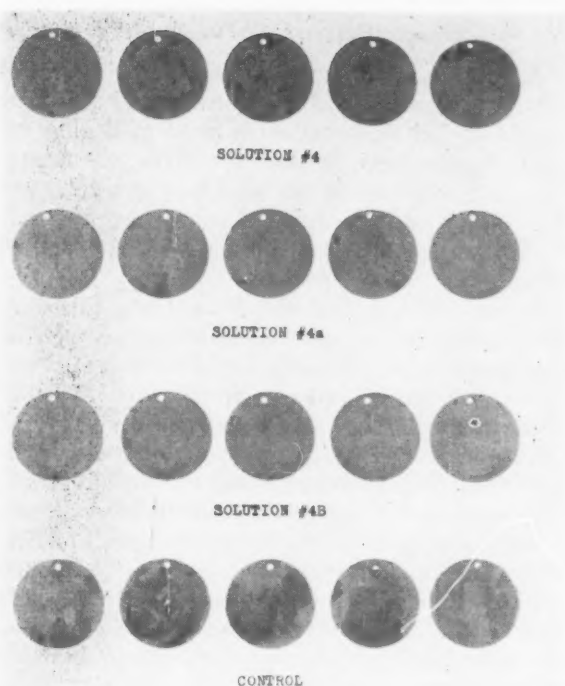


Figure 3. Salt spray test after chromic acid rinse using solutions of higher concentration.

Each solution also contained 5 ml. of the radioactive stock solution.

Three tests, similar to those previously reported, were conducted using the four solutions noted above. The results of these tests are presented in Table III. It will be noted that the progressive trend of increased adsorption with increased concentration is confirmed. The phosphoric-chromic acid mixture also shows the same advantage in amount of chromic acid adsorbed over the corresponding chromic acid solution as previously noted.

**TABLE III**  
**Adsorption of Chromic Acid**

Grams $\text{CrO}_3 \times 10^{-3} / \text{ft.}^2$				
Solution No.	Test #B-2	Test #B-3	Test #B-4	Average
<i>Zinc Phosphate Coating</i>				
4a _____	11.85	18.63	14.81	15.10
4b _____	18.59	28.19	30.40	25.73
8a _____	7.64	19.82	10.34	12.60
8b _____	12.03	23.26	23.85	19.71
<i>Manganese Phosphate Coating</i>				
4a _____	11.24	16.52	11.25	13.00
4b _____	20.40	25.31	22.52	22.74
8a _____	6.38	14.26	5.70	8.78
8b _____	11.85	23.96	17.46	17.76

#### **Inhibition of Salt Spray Corrosion**

The previous series of tests showed that the amount of chromic acid adsorbed continued to increase as the concentration of the rinse solution increased. However, it is an established fact that above a certain concentration the chromic acid will act to strip the coating from the basic metal. Therefore, it was deemed necessary to conduct salt spray corrosion tests to supplement the adsorption data previously obtained.

For the salt spray test, the eight groups of five zinc

phosphated coupons, which had been used for one of the adsorption tests, and one group of five phosphated panels, which had not been treated in a chromic acid rinse, were subjected to the vapors in the salt spray cabinet for six hours. The latter group was included to serve as controls. Zinc phosphate coated coupons, only, were used, as the chromic acid is known to have a greater stripping action on zinc than on manganese coatings.

The coupons after exposure are pictured in Figures 1 and 2. The same control coupons are included in both photographs for ease of comparison. It will be noted that the resistance to corrosion varies with the amount of chromic acid adsorbed which was reported above. This is substantiated by comparing the two photographs line for line to determine the effect of phosphoric acid in the rinse solution. This is also shown by comparing the coupons rinsed in like solutions of varying concentration where the effect of increasing concentration and chromic acid adsorption are shown. All coupons which were rinsed show increased corrosion resistance over that of the unrinsed control coupons.

Salt spray tests were also conducted on the coupons rinsed in the four solutions containing higher concentrations of chromic acid. These coupons and control coupons are pictured in Figures 3 and 4. Controls consisted of coupons not rinsed in a chromic acid rinse and a group of coupons rinsed in the highest concentration solution of comparative composition previously tested. The latter are included for comparative purposes.

Figures 3 and 4, although the photographs do not show the true condition of the coupons, indicate that the optimum solution concentrations are solution 4a for the chromic acid series and solution 8a for the chromic-phosphoric acid series. This is indicated by the fact that solutions of lesser and greater concentra-

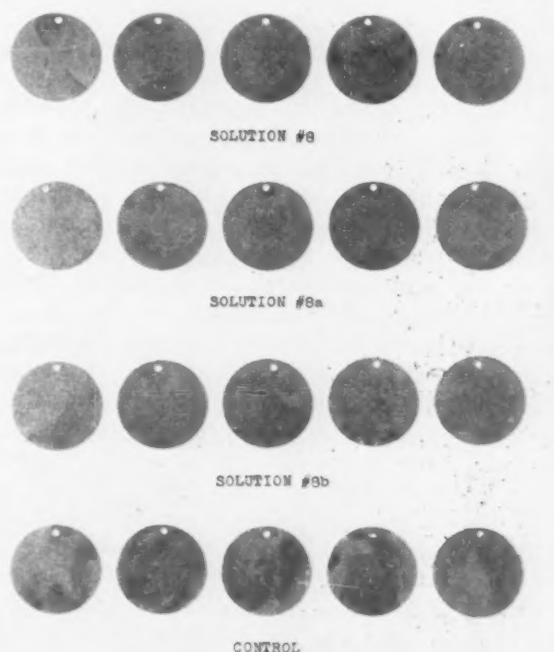


Figure 4. Salt spray test after chromic-phosphoric acid rinse using solutions of higher concentration.



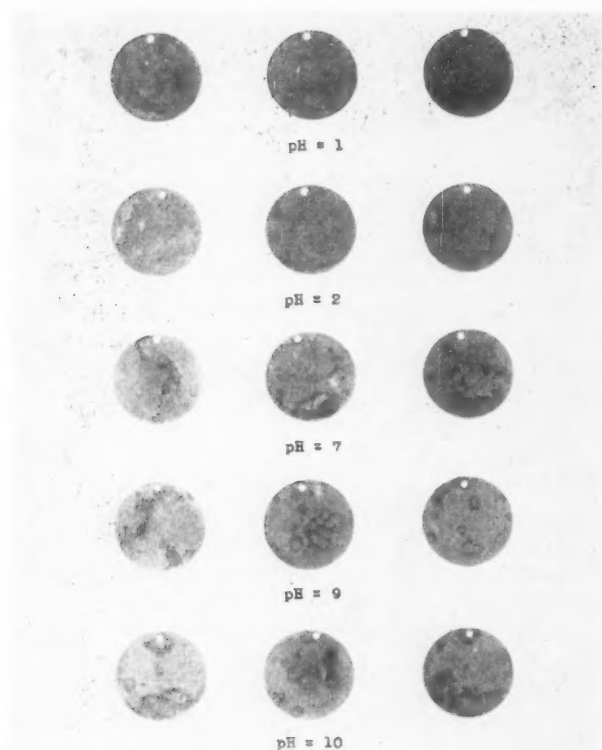


Figure 5. Salt spray test after chromic acid rinse using solutions of varying pH.

tion in each series seemed to provide less corrosion resistance. The reduced corrosion resistance with increased chromic acid adsorption may be explained by the fact that the amount of stripping action in the highest concentration solutions is of such magnitude that the film-healing qualities of the chromic acid are not adequate.

Evidence of the stripping action of the chromic acid was also found in the lower concentration solutions, such as solutions 1 to 4, inclusive. The presence of  $H_3PO_4$  in these solutions after use indicated a stripping action and removal of some of the phosphate coating.

The previously mentioned increased stripping with increased acid content prompted a side investigation to determine the effect of hydrogen ion concentration on the corrosion inhibition. Coupons were rinsed in solutions containing chromic acid (concentration approx. 0.33 oz. gal./ $CrO_3$ ) which had been adjusted with  $H_3PO_4$  or NaOH to give pH readings of 1, 2, 7, 9 and 10 respectively. They were then exposed to the salt spray. The results of this test are pictured in Figure 5. The photograph does not indicate the true condition of the panels as the pH-1 solution removed a large percentage of the coating and rusting was quite intense. It is interesting to note that at the higher pH levels (i.e., pH 7 to 10) there is a decrease in corrosion inhibition. This data ties in very nicely with the results previously reported as the pH values of the test solutions used did not drop below pH of 2 until the highest concentrations of acid were used, i.e. solutions 4b and 8b. Therefore, it may be concluded that for maximum corrosion inhibition a pH of 2 should be maintained as nearly as possible. Any variation from this value should be on the high side rather than the low side with a maximum of pH-3, which was the pH of solution #1.

### Desorption of Chromic Acid

This phase of the investigation was undertaken mainly to determine if the chromic acid adsorbed on the phosphated work was easily removed during a degreasing operation. It was not expected that the chromic acid would be desorbed to any extent. However, since a very effective tool was available, namely, the radiometric technique, a test was conducted to definitely answer the question.

Test coupons, which had been  $CrO_3$  rinsed and counted, representing all of the first eight test solutions were coated with a Cutback Rust Preventive conforming to U. S. Army Tentative Specification AXS-1759. After coating, the coupons were drained and then degreased in a trichlorethylene vapor degreaser. Then the coupons were recounted and the loss in chromic acid determined as a percentage of the original count.

The results of the above test are presented in Table IV. It will be noted that the losses are insignificant and are also offset by small gains in the case of two other values. Therefore, it is safe to conclude that phosphated work which is subsequently chromic acid rinsed and oiled may be shipped elsewhere for test and degreased without destroying the corrosion inhibition of the chromic acid film.

TABLE IV  
Desorption of Chromic Acid

Treatment	Solutions	% Loss	
		Zn Coating	Mn Coating
Vapor Degrease	1 to 4	+ .5	+2.3
	5 to 8	3.4	6.8
Water at 210°F.	1 to 4	16.9	15.0
	5 to 8	8.7	9.8
Water at 75°F.	1 to 4	6.1	2.9
	5 to 8	4.9	2.6

In line with the above problem, the desorption characteristics using hot and cold water rinses were also studied. One minute rinses in water at 75° and 210°F. were used in tests similar to the vapor degreaser test outlined above. The results of these tests are also presented in Table IV. It will be noted that even with a one minute rinse in boiling water from 83 to 92% of the chromic acid is still retained, indicating that most of the chromic acid is chemically adsorbed while only a small portion is physically held on the surface of the work.

### Summary

The use of radiometric techniques has provided a means of measuring the action or behavior of the chromic acid in the rinse solutions for phosphated work. Heretofore, estimates based on visual analysis of exposure test results were the only means of evaluating and comparing various solutions.

These quantitative measurements offer a definite basis for the following conclusions:

1. Chromic acid adsorption varies as the solution concentration varies.
2. Solutions containing phosphoric acid have increased rates of adsorption over solution of equal

(Concluded on page 69)



# Properties of Electrodeposited Nickel

A MUCH clearer picture of the effect of plating variables on the structure and properties of electrodeposited nickel has resulted from a comprehensive laboratory investigation<sup>1</sup> conducted over the past five years by Victor Zentner, Abner Brenner, and Charles Jennings of the National Bureau of Standards. In the course of the study, which was sponsored by the American Electroplaters' Society, cathode current efficiencies and the internal stress of the deposits were determined for a great number of different bath compositions and operating conditions, the chemical composition and microstructure of the deposits were investigated, and their thermal and mechanical properties were measured. The results show that hardness, tensile strength, and other properties of nickel deposits can be varied over a wide range by proper choice of plating bath. Moreover, it has been possible to explain this broad variation in properties on the basis of the physical nature of codeposited impurities present in small amounts.

Industrial use of nickel plating includes a variety of applications. In general, the thinner coatings are used for ornamental purposes or for protection against corrosion while the heavier deposits are applied to machine parts, where resistance to wear is an important



Figure 1. Electron micrograph showing the crystal structure in electrodeposited nickel from a Watts-type plating bath. This micrograph was obtained at the National Bureau of Standards by transmitting an electron beam through nickel deposited as a film one-millionth of an inch thick. (x 55,600)

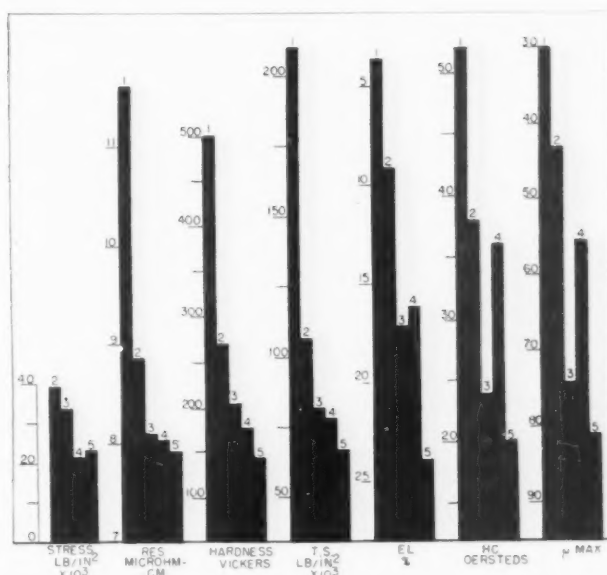


Figure 2. Block diagram summarizing data obtained by the National Bureau of Standards on the physical properties of nickel deposited from five different types of plating baths. 1: bright-nickel bath. 2: high-chloride bath. 3: bath containing half the nickel as chloride and half as sulfate. 4: sulfate bath. 5: Watts-type bath.

factor, and used in electroforming. Although quite different properties are required in different applications, until now little information has been available regarding the relationship between the conditions under which the plating is done and the resulting deposit. The NBS investigation provides a large amount of basic data which can now be utilized for the consistent production of deposits having desired properties. While major emphasis was placed on those mechanical properties of the deposits which are of immediate value in engineering applications, data were also collected on electrical and other properties which may be of value in determining the suitability of nickel deposits for special applications.

In the NBS study, about 240 different deposits were produced from 20 different types of baths operated over a wide range of temperature, current density, and pH. The test specimens were obtained by depositing nickel on sheet or tubular cathodes to a thickness of about 0.01 inch. During the plating process, current efficiencies and internal stress of the deposits were measured. After separation from the cathodes, the specimens were analyzed chemically, and their structures were studied by optical microscopy, electron microscopy (Figure 1), and X-ray diffraction. They were also tested for hardness, tensile strength, elonga-

tion, yields strength, Young's modulus of elasticity, fatigue limit, internal friction, thermal expansion, specific heat, heat of solution, electrical resistivity, and magnetic properties. The effects of heat treatment on many of these properties were studied.

It was found that the most important factor affecting the properties of the deposits is the type of plating solution, that is, the nature of the anion and the presence of special additives. Although deposits produced at lower temperatures were usually finer-grained than those obtained at high temperatures, the effects of variations in operating conditions, such as temperature and current density, are in general relatively small, provided the conditions are within the satisfactory operating range for the solution used.

On the basis of the physical and mechanical properties of the deposits, nickel plating baths may be classified in three main groups: *bright-nickel* baths, containing organic brighteners; *high-chloride* baths, containing more than 50 per cent of the nickel present as chloride; and *Watts-type* baths, which contain the nickel in the form of both sulfate and chloride in the ratio of 3:1. In general, the extremes in properties are shown by the bright-nickel and the Watts-nickel deposits while the properties of the high-chloride nickel are intermediate between the two (Figures 2 and 3). The bright-nickel baths yield bright deposits having the greatest hardness, tensile strength, resistivity, and coercive force of all types of nickel deposits, but they also have the lowest ductility, elongation, and magnetic permeability. The high-chloride baths, on the

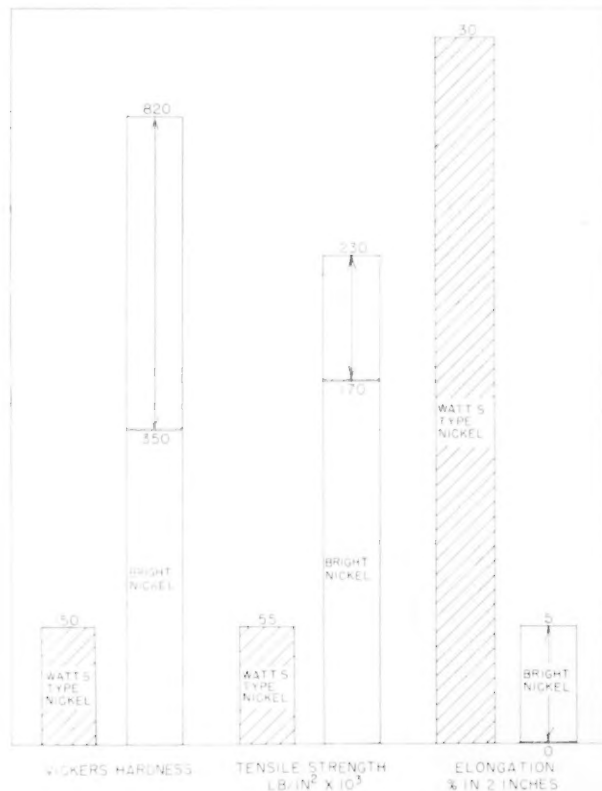


Figure 3. (Block diagram) Graphical comparison of the mechanical properties of nickel deposits obtained from Watts-type and bright-nickel plating solutions. The arrows show the range over which bright-nickel deposits vary.

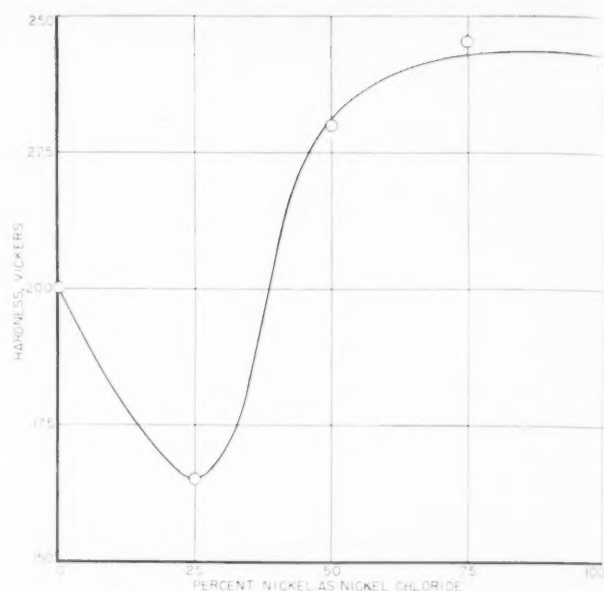


Figure 4. (Graph) Effect of the chloride content of the plating bath on the hardness of nickel deposits. Each point represents the average hardness of five to 10 deposits, each produced under different plating conditions in the National Bureau of Standards electrodeposition laboratory. No explanation for the pronounced drop in hardness at 25 percent chloride content has been found.

other hand, produce dull deposits which are somewhat below bright nickel in hardness and tensile strength but have a higher ductility. From the Watts-type baths are obtained dull grey deposits. These are the purest of the three types; they possess the lowest stress, hardness, tensile strength, resistivity, and coercive force and at the same time the highest ductility, elongation, and magnetic permeability.

The properties of the deposits were effected very little by the concentration of nickel in the plating solutions. However, the effect of the chloride content of the bath on the hardness of the deposit was rather striking (Figure 4). When a bath containing one-fourth of the nickel in the form of chloride and the rest as sulfate was used, a pronounced minimum in hardness of the deposit was observed. As yet no explanation for this effect has been developed.

In its influence on the mechanical properties of the deposits, the pH of the plating solution was second in importance only to the nature of the bath constituents. In the pH measurements, it was found that when the pH of the bath goes above 5, the tensile strength of the deposit rapidly rises and the ductility decreases (Figure 5). If the pH of the solution is made high enough, there is a marked increase in hardness and tensile strength and a decrease in elongation. However, these extreme properties are accompanied by such a great increase in stress that the deposits are likely to crack spontaneously or exfoliate.

The microstructure of the deposits was rather closely correlated with their observed properties (Figures 6 and 7). Thus, in micrographs of nickel deposits from baths of varying chloride content, the most coarse-grained deposit had the lowest hardness. In general, deposits with coarse-grained structures contained relatively small amounts of impurities and were soft, ductile, and low in tensile strength. On the other hand, deposits with either fine-grained structures or no visi-

le grain structures contained a relatively large amount of impurities and were strong and hard but not very ductile.

Heat treatment was found to have a much more pronounced effect on the mechanical properties of bright nickel than on those of Watts nickel (Figure 8). Thus, after heat treatment at 400°C, the tensile strength of bright nickel fell from about 200,000 lb/in<sup>2</sup> to about 20,000 lb/in<sup>2</sup>. By contrast, the tensile strength of Watts nickel decreased by only 15,000 lb/in<sup>2</sup> from an initial value of 75,000 lb/in<sup>2</sup>. A comparison of the microstructures of the two types of deposits shows large clean grains in the Watts nickel while the bright nickel deposits have dark areas which may indicate either inclusions or voids.

On the basis of the data obtained in the investigation, it appears that the widely varying properties shown by electrodeposited nickel are determined primarily by the chemical and physical nature of codeposited impurities—usually small quantities of oxygen, hydrogen, carbon, or other elements present in small fractions of a percent. This is shown not only by the parallel trend in the variations of many of the properties, indicating a common basic cause, but also in the correlations found between properties and crystal or microstructure and in the pronounced dependence of the properties on bath composition. Because large changes in the deposits result from the presence of certain type of ions or minute amounts of special additions to the plating bath, it is reasonable to assume that the distinctive character of the deposits is caused by the codeposition of various kinds of foreign matter which may vary in quantity as well as in effective-

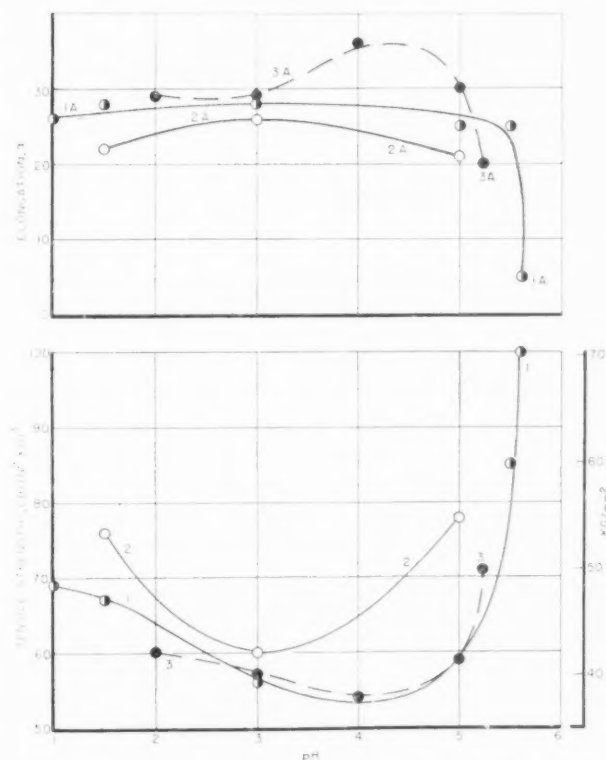


Figure 5. (Graph) Effect of the pH of the plating bath on the tensile strength and elongation of nickel deposited at 2 and 5 amp./dm.<sup>2</sup> Curve 1: Watts bath at 55°C. Curve 2: modified Watts baths at 30°C and 55°C. Curve 3: composite curve from data obtained by Gardam, Macnaughtan and Roehl.

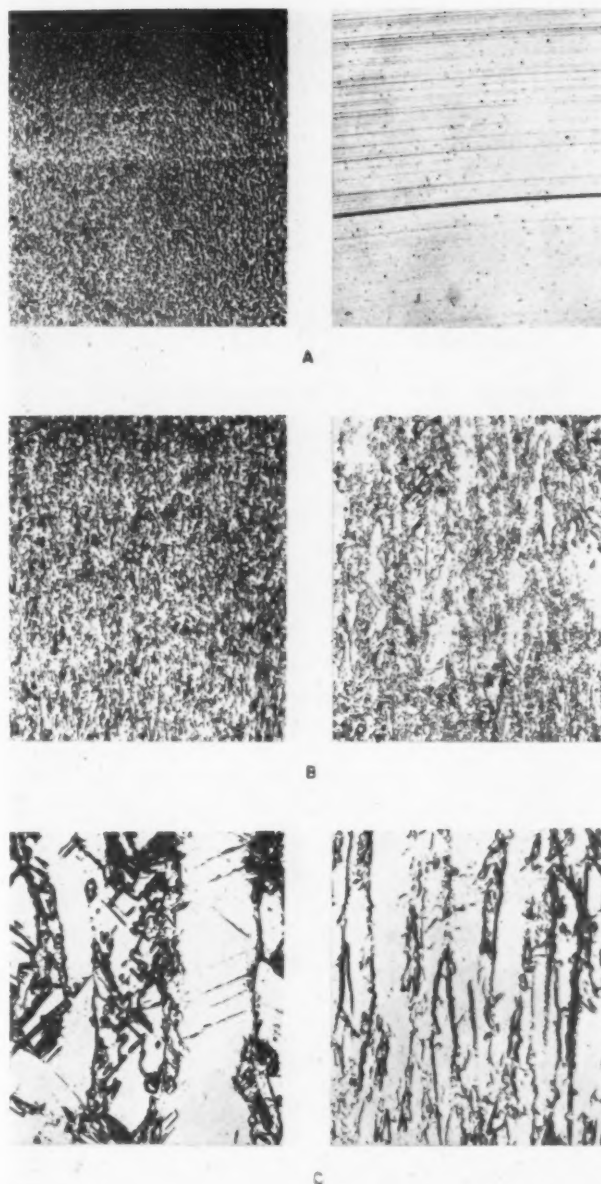


Figure 6. Microstructure of typical nickel deposits obtained at the National Bureau of Standards from bright-nickel plating baths (A), high-chloride baths (B), and Watts-type baths (C). In general, it was found that the more fine-grained deposits (A) have greater hardness and tensile strength. (x 250)

ness. The codeposited material may sometimes influence the properties of the deposit directly; in other cases, it may result in a fine-grained structure, perhaps with lattice distortion and internal stresses, which in turn affects the physical and mechanical properties of the deposits.

In general, it would seem that substances present in the plating solution affect the properties of the electrodeposit only to the extent that they influence the codeposition of foreign material. Thus, the great differences in the properties of bright-nickel and Watts-nickel deposits can be ascribed to impurities in the bright nickel derived from the organic additives used to produce the brightening. In fact, the Bureau's analysis of the bright-nickel deposits showed that they contained carbon and sulfur inclusions totalling about 0.1 percent, whereas the Watts-nickel deposits did not contain these impurities. On the other hand, some of the variations in the mechanical properties of the Watts-nickel deposits can be attributed to the presence



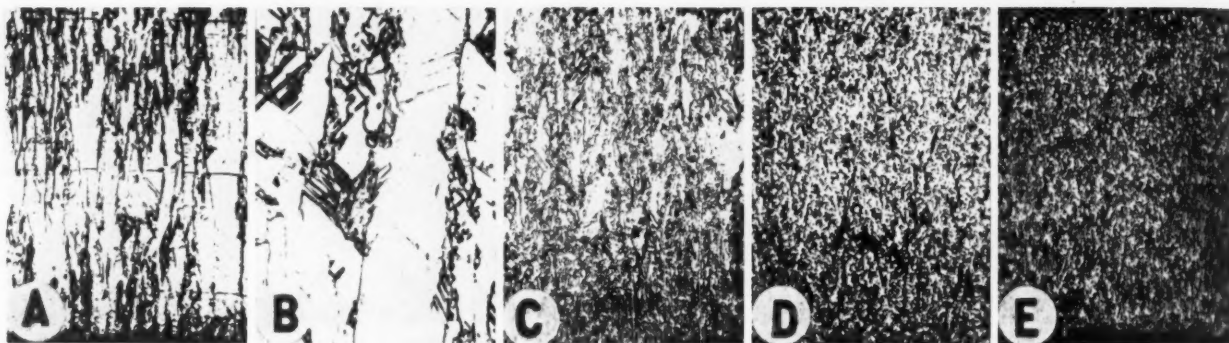


Figure 7. Micrographs showing the effect of increasing chloride content in the plating bath both on the structure and hardness of electrodeposited nickel. In A, the plating bath contained no nickel chloride; all the nickel was in the form of sulfate. The other baths contained 25 percent chloride (B), 50 percent chloride (C), 75 percent chloride (D), and 100 percent chloride (E). In each case the remainder of the nickel was present as sulfate. As the more fine-grained deposits have been found to be harder, it is evident that the 25 percent chloride bath (B) produces the deposit of least hardness. The deposits were obtained at a temperature of 55°C., a current density of 5 amp./dm.<sup>2</sup>, and a pH of 3.0 (x 250).

of small amounts of oxide. For example, a good correlation was found to exist between the mechanical properties of Watts-nickel deposits and their oxygen content.

It thus becomes apparent that those electrodeposited coatings that are of value in industry are not pure coatings, but owe their valuable properties to the presence of small amounts of impurities. The smooth, thick electrodeposits used by the plating industry are actually exceptional inasmuch as the pure metals would be deposited as a mass of large crystals rather than a coherent layer.

The mechanics by which foreign material is codeposited with nickel is a matter of speculation, but the NBS study indicates that it is probably an adsorption

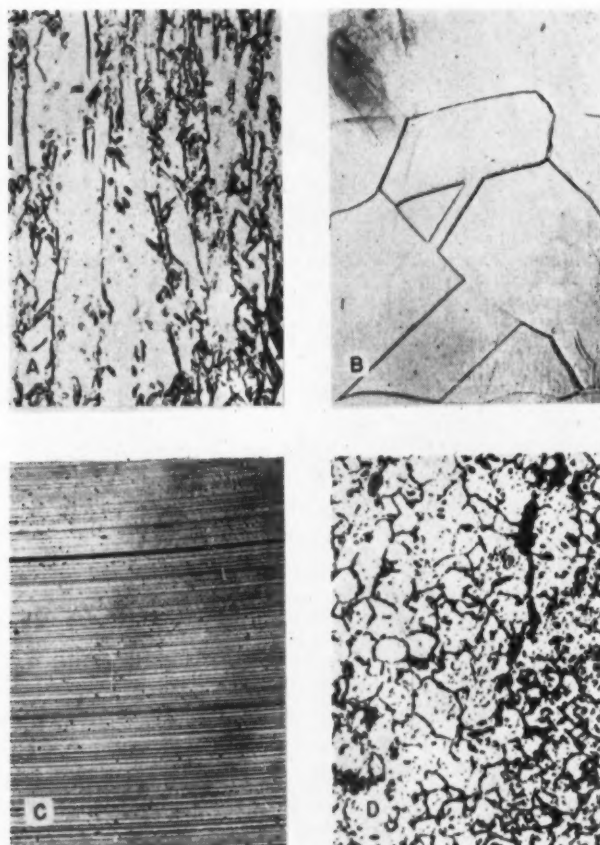


Figure 8. Microstructure of nickel deposits before and after heat treating. A: Watts nickel as deposited. B: Watts nickel heat-treated at 1000°C. C: bright nickel as deposited. D: bright nickel heat-treated at 1000°C. The dark areas in the heat-treated bright nickel may indicate either voids or inclusions. (x 250)

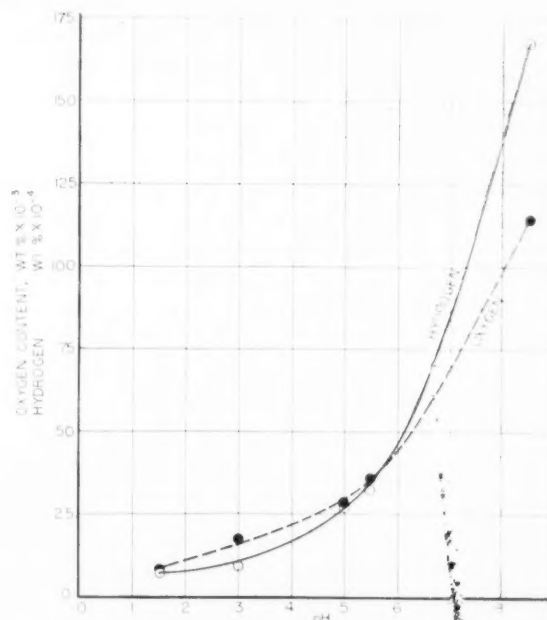


Figure 9. (Graph) Effect of pH of plating on the oxygen and hydrogen content of nickel deposits from data obtained at the National Bureau of Standards. As the tensile strength of nickel deposits has also been found to increase with pH a close correlation apparently exists between mechanical properties of deposits and their oxygen content. This relationship lends support to the Bureau's hypothesis that the properties of an electrodeposit are determined primarily by the nature of codeposited impurities. Each point is an average value for 26 deposits, obtained from 10 different solutions at various temperatures and current densities.

phenomenon rather than an electrochemical one, as has sometimes been postulated. The adsorption hypothesis is sufficiently versatile to explain the very specific effects of certain additives and the influence of the anion of a plating solution on the nature of the deposit. Some substances, instead of being directly adsorbed, may so modify the pH of the cathode film that basic compounds are codeposited with the metal. Further research is needed on adsorption phenomena and the processes taking place in the cathode film during electrolysis. More precise methods of analysis will be required in order to correlate the content of foreign material with lattice distortion and crystal structure.

1. For further details, see: The effect of plating variables on the structure and properties of electrodeposited nickel, by Victor Zentner, A. Brenner, and C. W. Jennings, *Plating* 39, 865 (1952).



# Radioactivity Helps Study of Silver Brighteners

By S. E. Eaton, R. W. Fabian, E. H. Newton, Arthur D. Little, Inc., Cambridge, Mass.

THE following is an account of some exploratory work\* on the behavior of ammonium thiosulfate brightener in silver cyanide plating baths using radioactive sulfur as a means of detecting and measuring the thiosulfate sulfur. Although the work is of an exploratory nature, it is felt that results might be of interest to readers who are concerned with the phenomenon of brighteners.

## Introduction

One of the remarkable features of brighteners in a silver plating bath is their ability to cause dramatic changes in surface brightness at very low concentrations. For example, only two fluid ounces of a 60% solution of ammonium thiosulfate when added to 100 gallons of plating bath is sufficient to alter the plate produced in the bath from a dull white to a lustrous surface which is much easier to buff to a mirror-like polish. Carbon disulfide brighteners are effective in even lower concentrations.

Not too much is known about the mechanism of sulfur-containing brighteners in silver cyanide plating solution, but it has been postulated that a minute amount of brightener or a derivative thereof might plate out on the cathode with the silver and prevent the formation of large silver crystals which would produce a rough silver surface. If this were true, sulfur should be present in the silver deposit, but the amount to be expected is below the limit of ordinary chemical detection when one considers that only a minute amount is present in the plating bath and some of this is recoverable as a sludge as the bath ages. The use of radioactive sulfur, however, provides a much more sensitive analytical tool for measuring sulfur. In the present work, radioactive sulfur has been definitely detected in measurable quantities in plated silver and some observations on its conditions of deposition have been made.

## Experimental

Radioactive sulfur 35 was procured from the Atomic Energy Commission and synthesized into ammonium thiosulfate by a method adapted from that of Libby<sup>1</sup> and Anderson<sup>2</sup>.

\*Sponsored by Oneida Ltd., Oneida, N. Y.

The thiosulfate ion contains two sulfur atoms, each of which possess its own discreet properties. Only the sulfidic sulfur atom was made radioactive and hence all measurements during this work were of this atom only. Tagged brightener was added in the above concentration to an ordinary silver cyanide plating bath and copper cathodes were cleaned, "struck", and plated at 15 amp. per square foot in the customary manner. At the completion of each plating operation, all specimens were removed from their respective baths, drained for 15 seconds, immersed for one minute in distilled water, rinsed for two minutes under cold running tap water, and were finally immersed in boiling water for five minutes. Activity measurements were then made with a thin end-window Geiger Counter with a logarithmic amplifier. Further treatment such as, for example, a 30-minute immersion in boiling water did not appear to lower appreciably the activity of the plate. This suggests that the sulfur was tightly bound by chemisorption or actual compound formation.

In a typical case, in which about 0.003" of silver was plated in the radioactive bath, duplicate activities averaged 33 counts per minute after subtracting the background value of 48 cpm. The activity and consequently the sulfur appeared to be distributed more or less evenly through the thickness of the silver because the activity of the surface of the plate remained essentially constant as small increments of the plate were removed on a lathe. As a further check on this point, heavy silver plate (.015") was plated on a stainless steel cathode from which it was then peeled. Activities on both sides of the plate were roughly the same. Since the radiation from sulfur 35 penetrates only about 0.001" of silver, only a fraction of the sulfur in that thickness of silver was being measured.

## Sulfur Found in the Deposits

The actual amount of sulfur found in the plate has been estimated by a simplified calibration method, based on the fact that absorption of beta rays is approximately proportional to the total mass per unit area of the absorbing medium and is essentially independent of its atomic weight. Thus standards could be made up conveniently from aqueous solutions contain-

ing known quantities of thiosulfate and a chart prepared showing the approximate weight of sulfur per gram of silver (or solution) as a function of its radioactivity. In this method of calibration, the sample thickness was greater than the penetrating range of the sulfur radiation and the sample diameters and distance from the Geiger Counter were constant. The weight of sulfidic sulfur per gram of silver deposited from the standard commercial plating bath containing two fluid ounces of 60% ammonium thiosulfate per 100 gallons of plating bath was estimated to be roughly three to five micrograms of sulfidic sulfur per gram of silver. This corresponds to about 0.0003 to 0.0005% by weight and is equivalent to about one sulfur atom to every 60,000 to 100,000 atoms of silver.

When the concentration of brightener was reduced to  $\frac{1}{6}$  of the regular concentration, the resultant silver plate appeared to be of about the same brightness as before but the sulfidic sulfur content as measured by the activity was reduced to about half.

When silver, which had been plated in a control bath without radioactivity, was immersed in a bath containing radioactive brightener without any externally applied electric current, the plate appeared to pick up sulfur slowly. In about three hours, activity reached a practical maximum which was comparable with that of a plate prepared completely in the active bath. As might be expected, this sulfur picked up by immersion was removed with a 0.002" surface layer on the lathe. Since no accurate calibration was ever made of the counts per minute in terms of activity of sulfidic sulfur concentrated in the surface layer, we cannot say exactly how much sulfur was adsorbed on the surface but, based on approximations of the yield obtained in the synthesis, the initial total activity and assuming a 25% overall counting and geometric efficiency, the equilibrium activity on the immersed plate is the right order of magnitude to correspond with a monomolecular layer of sulfidic sulfur if the sulfide were present as some simple salt of silver, for example, silver sulfide or oxysulfide.

To determine whether the direction of current flow affected the pick up of sulfidic sulfur by silver, anodes which had been used to plate other specimens were subsequently allowed to stand in the active baths with regular brightener content for 18 hours. They then showed a surface activity of about 40 counts per minute. When treated similarly in the bath containing only  $\frac{1}{6}$  the normal concentration of brightener, the activity was only slightly lower, about 35. When the same anodes and the same baths were used to plate another specimen for a period of 30 minutes, and then without cutting the current off, the anodes were withdrawn slowly from the plating bath and simultaneously washed down with a stream of distilled water, the activity remaining after the usual rinsing, washing, boiling, and drying procedure was still about 27 cpm showing that the attachment of sulfur is affected only to a small extent by the direction of current.

Several other base materials in various degrees of physical roughness were immersed without current for

1½ hours in a plating bath containing the normal concentration of tagged brightener. Materials tested were Pyrex glass, etched mild steel, 18-8 stainless steel, nickel plate, and chromium plate. These surfaces when washed and measured in the usual manner gave no indication of having picked up any sulfur, which again suggests a chemical specific interaction between silver and the brightener.

An attempt was made to determine whether the sulfur picked up by the silver during plating was present in the solution in colloidal or ionic form. The cathode was wrapped in a parchment-type dialyzer paper and plated in the regular way in a tagged bath for 15 minutes. Before the end of that time, fine silver nodules had begun to form on the outside surface of the paper. When uncovered, the cathode was found to be coated with a highly active, finely divided removable powder, presumably metallic silver. The activity of the remaining plate was higher than any other plate and indicated a concentration of about 11 micrograms of sulfidic sulfur per gram of silver. Interpretation of this experiment is difficult. At least it is evident that the brightener is not normally present as a colloid since it passed through the parchment paper easily. It is probable that the roughness of the deposits is caused by low agitation rate of the cathode surface because of the dialyzer paper. High activity might then be the result of the increased surface area. It is also probable that migration of the thiosulfate anion through the paper to the catholyte built up a higher sulfur concentration in the catholyte which helped give an above-average sulfur content to the deposit. Another possibility is that the brightener is coagulated at the cathode to a particle which cannot escape through parchment. This is in accord with the observation noted earlier that a precipitate of high activity can be filtered from a used bath. This precipitate may actually form at the cathode.

### Conclusion

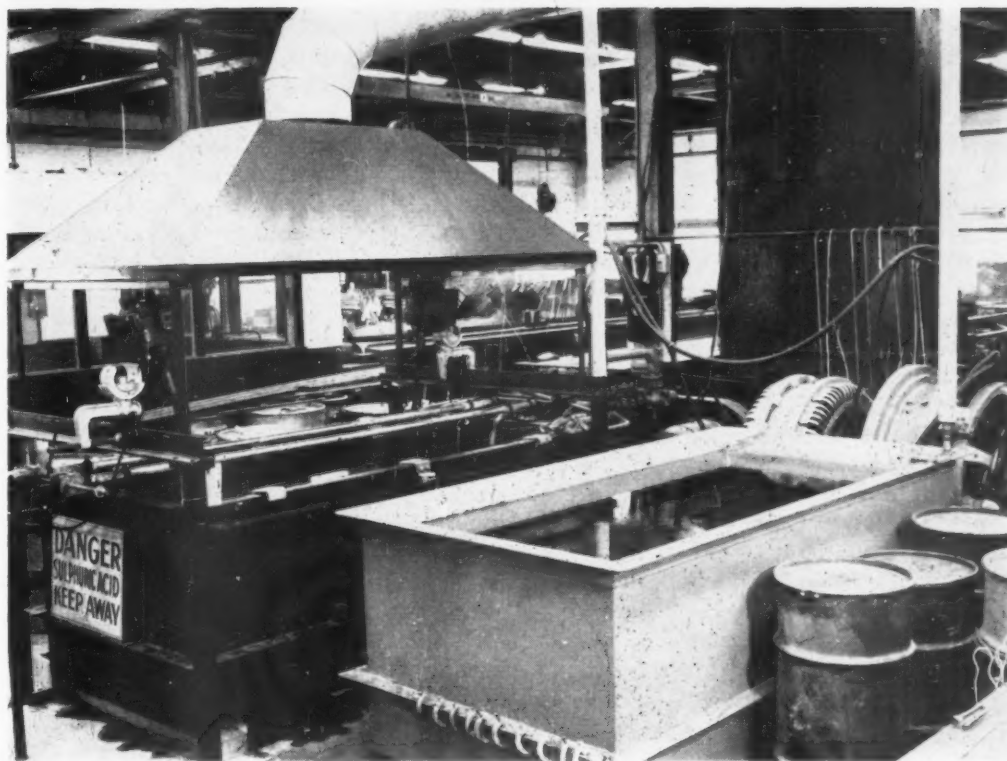
From the above observations, it appears that the sulfidic sulfur atom of ammonium thiosulfate attaches itself in some form to a silver surface in a cyanide plating bath, whether that surface is being electroplated or not. If it is not being plated, the sulfur-containing deposit remains on the surface. If plating is taking place, the sulfur deposits with the silver and remains within the plate. At least part of the sulfur is found in a precipitate which accumulates in the bath during use.

It is not known in what form the sulfur is present on or in the silver. The fact that the sulfur is tightly bound to the silver and does not deposit on some other metallic and non-metallic surfaces suggests that the sulfur is chemically bound to the silver, possibly as the sulfide. It also appears possible that the sulfur could be present in the silver plate as adsorbed colloidal particles containing at least the sulfidic sulfur of the brightener.

### References

1. Libby, J. Am. Chem. Soc., **59**, 2474 (1937).
2. Anderson, Z. Phys. Chem., **B32**, 237 (1936).

The three clamps visible on the near side of the sulfuric acid tank are used to suspend the lead-clad copper simple return-type coils, through which Freon is directly expanded in the electrolyte. Freon compressor can be seen at rear end of tank along side of synchronous motor-driven generator.



## Lead Clad Copper Solves an Anodizing Problem

**S**UCCESSFUL use of lead-clad copper cooling coils with direct expansion of Freon in the anodizing of aluminum at the *Grumman Aircraft Engineering Co.* promises to revolutionize the job of anodizing aluminum and to make possible the mass production of strong anodized aluminum surfaces that approach the hardness of sapphire.

When the aircraft company was confronted recently with the task of producing a surface hard enough to meet demanding combat conditions for fighter planes, it decided to adopt the hard coat process developed by the *Aluminum Co. of America*. There was, however, one difficult feature to this process — the absolute necessity for keeping the electrolyte cooled down to 50°F. and sometimes to 25°F. for long periods of time. This presented a serious problem because high temperatures are generated, first during the mixing of the acid electrolyte and then during anodizing by the repeated introduction of heavy charges of electricity into the electrolyte, which represent heavy Btu. inputs.

Water in ordinary lead coils is unsatisfactory as a cooling medium under these conditions, because of the heat generated by high current density requirements of the process. Calculations of heat transfer, water temperatures and Btu. input showed that the square footage of lead coil cooling area required to do the job would leave little tank space for anodizing. As a matter of fact, they showed that the lead coils would weigh about 2,700 pounds, would have to contain 430 lineal

feet of lead pipe, and would have to be fabricated in five sections, with separate inlets and outlets hooked into lead pipe manifolds. Grumman engineers had heard of lead-clad copper, one of the newer clad metals,\* and they decided to investigate it in the hope that it would solve this problem.

Pipe, in this form, combines lead's well known ability to resist the corrosive action of sulphuric acid with the strength and heat transfer properties of copper tubing; and as a result, it is finding many applications in the heating, as well as the cooling of acids. Copper absorbs and transfers heat with great efficiency, and since the lead cladding is chemically bonded to the copper, heat transfer is kept at a high value. The physical strength to withstand high steam pressure, up to 200 psi. is provided by the copper tubing. This makes it possible to keep the square footage of the heating area to a minimum and also to use very rapid heating cycles when it is desirable to do so. In addition to its use in heating acids, lead-clad copper seemed to lend itself efficiently to cooling operations, and it was this that the Grumman engineers decided to investigate.

When sulphuric acid is selected for the electrolyte, the use of lead coils is indicated, because the protective lead sulphate coating which forms on this metal provides excellent corrosion resistance to sulphuric acid. However, there are certain objections to lead coils. For

\*Cupralium, Knapp Mills, Inc., N. Y. C.



one thing, the metal is of low physical strength and, in the presence of high temperature and temperature changes, it is subject to fatigue. The wall thicknesses and footages of lead pipe which must be used result in extremely heavy coils; and to add to the disadvantages, excessive wall thickness tends to reduce heat transfer value.

In cases where antimonial lead coils are used to provide greater physical strength, their heat transfer value is approximately 15% lower in comparison to ordinary lead. It is true also that antimonial lead is brittle, and under temperature changes is inclined toward cracking.

It was believed that lead-clad copper coils would solve this problem because:

- (1) Copper is standard for use with Freon;
- (2) Copper easily withstands the pressures developed during the expansion of Freon;
- (3) The thermal conductivity of lead-clad copper is excellent;
- (4) The coils are rigid, self-supporting, and not subject to distortion or collapse.

However, the science of refrigeration is complex, and still subject to many unexplained natural phenomena. This caused the company to consider the contemplated use with caution and a natural reserve. Admittedly they were not refrigeration experts themselves, so their first step was to consult men who do specialize in that field. This resulted in a variety of negative comments and conjectures which made it difficult to determine the soundness of the idea.

First, they calculated the square footage of lead-clad copper coil needed to remove 115,000 Btu. per hour. Then two identical coils were designed, each containing 90 lineal feet of 1 $\frac{3}{4}$ " O.D. copper tubing with a  $\frac{3}{16}$ " lead cladding. The design provided for suspending the coils by means of three lead-clad steel hangers on either side of the tank containing the electrolyte. The over-all measurement of each coil was 2 ft. high by 7 $\frac{1}{2}$  ft. long. Because of the relatively small footage, they were of the simple return bend type, and projected into the tank 3 $\frac{1}{2}$ ". As a result, practically the entire area of the tank was available for the anodizing process.

The total of 180 ft. of coil allowed for a safety factor, in that it exceeded the mathematical calculation of square feet of cooling area required. To provide other safety factors, it was decided to use an oversized compressor, with a constant capacity of 15 tons of refrigeration, together with oversized lines and valves, rather than the 10 ton unit indicated. This compressor was installed on a chassis which would make it possible to step up refrigeration output to as much as 20 tons if necessary. Freon 12 was selected as the coolant, but if still lower temperatures proved necessary, provision was made to use Freon 22, and thus make available an improvement in cooling temperatures of as much as 30 percent additional. That these procedures resulted in an extremely flexible cooling installation is obvious. The anodizing installation was fully completed by October 5, 1951, and after several trial runs, production commenced on November 8, 1951.

In the ensuing period the Grumman Company has anodized aluminum with coatings that required carefully controlled temperature levels. During this time the coils have maintained constant temperatures ranging from 50°F. down to 25°F., and have done so with ease.

Furthermore it has not been necessary to use the oversized capacity of the compressor or lines, or to resort to a lower temperature coolant than Freon 12.

This installation has now been in service sufficiently long to demonstrate that it can successfully meet one of the troublesome phenomena in refrigeration, namely the fact that cooling results, during the early stages of operation, are sometimes startlingly better than those attained later. This is believed to be due to insulating films which form, during these initial operations, on both the inside and outside coil areas.

Anodized aluminum coatings have a variety of important properties, such as resistance to corrosion and to abrasion, the ability to absorb substances, and extreme hardness. The value and importance of anodized aluminum to American industry cannot be over-estimated. Up to the present time, Grumman has used the anodizing process only on smaller aluminum parts for airplanes, especially those which must withstand the heaviest load, or which receive the hardest wear. Now, however, the consistent high efficiency of lead-clad copper coils, when used with the Aluminum Co. of America's hard coat process, offers great potentialities for the mass production of anodized aluminum.

The ultimate use of this finish in the production of airplanes, automobiles, and countless other large products may have far reaching results. Some forms of anodized aluminum are harder than carburized or hard chromium plated steel. In fact, certain of these anodized aluminum surfaces approach the hardness of sapphire.

#### Test Results

An improvement in cooling might result in distinct benefits and, with this thought in mind, a specific test of the cooling capacity of the lead-clad copper coil was arranged. 20% sulphuric acid was selected as a commonly encountered baume. The tank had a capacity of 5500 pounds of this concentration. Accordingly the required gallonage of water was run into the tank, the refrigeration system was started; and the temperature of the water checked. This was found to be 50°F. Then the requisite amount of 60° Bé sulphuric acid was added to the water to bring about a 20% mixture. The temperature of the solution at this point read 180°F.

The tank had been equipped with two air inlets, so that the cooling process might have the benefit of agitation. Temperature readings were taken by means of four thermometers, which were suspended equidistantly in the solution and kept under constant observation. The temperature of the solution had not reached more than 180°F. before it commenced to decrease very noticeably. In less than eight minutes, it was below 100°F., and in thirty-two minutes the temperature reached 50°F.

Reviewing the operation of the refrigeration system, it was established that the coil, which had been designed originally to remove 115,000 Btu's per hour, had actually removed heat at the phenomenal rate of 1,200,000 Btu's per hour. Whether this phenomenon may be attributed to the employment of oversized valves and lines, or to some other sound technical explanation has not yet been established. Therefore further tests are planned. Since that time, the installation has been used for the normal anodizing of aluminum.

(Concluded on page 72)



# A Non-Electrolytic Smoothing Treatment for Steel

By W. A. Marshall

## PART II

### *Adhesion of Electrodeposited Nickel to Ferrous Metals Treated with the Solution*

Quantitative tests were made by deposition of nickel to a thickness of 0.02"-0.05" upon small treated specimens of steel. Adhesion was assessed by chiseling at edges and corners. Quantitative tests on V10 steel were made on test-pieces of the A.R.E. pin and bush type.<sup>2</sup> A pin of standard taper was fitted into a corresponding taper bore in a bush, both components being machined from the steel under investigation. The face of the bush and the end of the pin were ground to a plane surface and this surface was further rubbed down on emery papers until the junction between pin and bush was invisible. The test-piece was stopped off with wax so as to expose only the prepared face. After etching the composite face, the "smut" was removed by vigorous hosing and nickel was deposited upon the steel to a thickness of not less than 0.2". Adhesion was then measured by pulling the pin out of the bush in a tensile testing machine. All etching was carried out at room temperature (ca. 20°C.) for one hour. The specimens after nickel deposition were heat treated at 150°C. for two hours to remove hydrogen embrittlement before testing.

Hammer and chisel tests indicated very strong adhesion between mild steel, etched as described, and electrodeposited nickel. No separation was possible.

A.R.E. adhesion tests on V10 steel indicated very strong adhesion of nickel, of the order of 50 tons/in.<sup>2</sup> Typical figures are quoted in Table IV.

#### *Effect of Delay in Commencing Deposition*

As delay between etching and commencement of deposition is unavoidable in practice, the effect of various measured delays was studied. It appeared probable that a protective film present on the treated steel might permit of longer delay than is permissible in normal electrodeposition practice. Using the anodic sulphuric acid method for etching alloy steels, delay of more than 30 seconds is considered likely to impair adhesion of the deposit.

Six A.R.F. adhesion test-pieces of the pin and bush type, made from V10 steel, were treated in the standard solution at room temperature for one hour. The "smut" was removed by vigorous hosing and deposition of nickel was begun after measured periods of delay, ranging from 20 seconds to 8 minutes. During the periods of delay the specimens were exposed to the laboratory atmosphere and were not allowed to dry. Results are given in Table IV.

TABLE IV.—EFFECT OF DELAY IN COMMENCING-DEPOSITION: (V10 STEEL)

Delay	Adhesion value tons/in. <sup>2</sup>	Nature of break
20 seconds ...	46.7	Deposit sheared
30 seconds ...	49.3	" "
1 minute ...	49.3	" "
2 minutes ...	50.7	" "
4 minutes ...	46.7	" "
8 minutes ...	52.0	" "

Minimum possible for adequate washing.

All the specimens showed some necking and elongation of the taper pin, which was most pronounced in the 2 minute and 8 minute specimens. It is believed that apparent variations are due merely to differences of thickness and soundness of the nickel deposits. The results indicate that delay up to 8 minutes between washing and commencement of deposition does not adversely affect the adhesion value obtained. This further supports the theory that the treated steel is covered by a protective film.

#### *Effect of "Smut" Upon Adhesion*

An A.R.E. adhesion test-piece of V10 steel was stopped off and etched in the usual manner. No attempt was made to remove the grey "smut" resulting from the treatment, the surface being merely washed thoroughly with a gentle stream of water. Deposition was begun on the smutted surface.

An adhesion value of 23.4 tons/in.<sup>2</sup> was obtained, compared with values already reported of about 50 tons/in.<sup>2</sup> when the smut was removed. Separation occurred at the Ni/Steel interface. It is therefore necessary to remove the smut to obtain maximum adhesion.

#### *Qualitative Test on Cast Iron*

Small flat specimens of white-heart malleable and grey cast iron were etched for one hour at room temperature, the black smut on the grey cast iron was removed by violent hosing and the specimens were built up with electrodeposited nickel. Adhesion was assessed by hammer and chisel test.

The malleable iron gave very strong adhesion, no separation being possible. The grey cast iron gave apparently weak adhesion and the deposit was readily rolled off with pliers. However, the under side of the deposit, when tested with copper sulphate solution, showed an adherent layer of iron particles, indicating that fracture had occurred in the basis metal.

#### *Effect of pH of Nickel Solution Upon Adhesion*

Evidence of the existence of a protective film on the etched steel suggests that the pH of the nickel solution in which deposition is started may have an

effect on the adhesion value obtained, since a relatively acid solution might remove the film more rapidly than one less acid, and the presence of a film at the interface would be expected to prevent or reduce adhesion. To test this theory, two A.R.E. adhesion test-pieces of V10 steel were etched and hosed as usual. One was built up in nickel solution of pH 3.0 and the other in a solution of pH 5.5. The composition of the two solutions is given in Table V.

TABLE V.—COMPOSITION OF NICKEL PLATING SOLUTIONS

Type of solution	NSBKC	NSAKC
pH (comparator) ... ..	3.0-3.5	5.5-5.9
Nickel sulphate crystals ...	240 gm./l.	100 gm./l.
Potassium chloride ... ..	20 gm./l.	8 gm./l.
Ammonium sulphate ... ..	—	20 gm./l.
Boric acid ... ..	30 gm./l.	—

Results of adhesion tests are given in Table VI.

TABLE VI.—EFFECT OF pH OF NICKEL PLATING SOLUTION UPON ADHESION TO V10 STEEL

pH of solution at start of deposition	Adhesion value tons/in. <sup>2</sup>
3.0 (NSBKC)	50.0
5.5 (NSAKC)	nil

Separation occurred in both cases at the Ni/Steel interface.

### Discussion

The principal phenomena reported above are (1) the smoothing action, (2) the effect of the reagent in inhibiting corrosion of the steel and (3) the strong adhesion of the nickel deposit to a treated specimen even when commencement of deposition is delayed for a considerable period after treatment.

No adequate explanation of the smoothing action can be advanced. It is significant that the smoothing process is accompanied by periodic phenomena. Thus periodic discharge of oxygen from the surface of the specimen occurs and in further work, not yet published, it has been found that the potential fluctuates periodically. The process therefore appears to be analogous to anodic polishing, which is commonly accompanied by similar effects. Hedges<sup>3</sup> points out that periodic phenomena appear always to be associated with film formation and many of the effects reported in this paper are concordant with the assumption that film formation and destruction occurs during treatment at the surface of the steel. An early theory, based upon the relative solubilities of ferrous and ferric oxalates, assumed that the first action of the reagent was to coat the specimen with an insoluble film of ferrous oxalate. This film was subsequently rendered soluble by oxidation in the presence of hydrogen peroxide after which it dissolved and the process was repeated in a cyclic manner. More ready diffusion of the peroxide to the prominences in contrast to the stagnant conditions in the recessed areas was held to account for a progressive smoothing action. The oxidation of ferrous oxalate by

hydrogen peroxide is accompanied by the liberation of oxygen which would account for the observed periodic gas evolution, while the potential of the steel would clearly exhibit fluctuations synchronizing with the periodic formation and dissolution of the ferrous oxalate film. This theory received some support during an investigation to seek other metal/acid systems capable of producing insoluble "ous" and soluble "ic" salts. It was found, for example, that when copper was immersed in solutions containing hydrochloric acid and hydrogen peroxide periodic film formation accompanied by appreciable brightening of the metal occurred, although in these experiments oxygen evolution did not occur except at random points in the early stages of treatment. In this connection, Hedges<sup>4</sup> has reported similar periodicity upon copper with solutions containing hydrochloric and nitric acids.

The conditions for regular periodicity are likely to be most favorable in still solution. Relative motion between the steel and the solution and rise of temperature of the solution would, by increasing the rate of diffusion, hinder the establishment of an insoluble ferrous oxalate film and tend to promote a more continuous and rapid rate of attack on the steel, with impaired smoothing action. These deductions are borne out by the experimental results. With alloy steels which produce a "smut" during treatment, diffusion to the interface would be impeded and periodicity might be expected to be slower than with mild steel and the rate of attack reduced. The facts support these conclusions.

This simple theory has had to be abandoned, however, following the more recent discovery that periodic effects accompanied by partial brightening of steel may be obtained in mixtures of sulphuric acid and hydrogen peroxide containing no oxalic acid. Furthermore, it has now been demonstrated that the formation of the protective film present on a treated steel specimen is not dependent in any way upon the presence of the oxalate ion. It may well be that, during immersion a fluctuating diffusion layer or composition, gradient, rather than a discreet solid membrane, is formed. Further work is in hand to determine the mechanism of the polishing process.

The presence of a discreet film upon the surface of a treated steel specimen has been established in a separate investigation.<sup>1</sup> This appears to account satisfactorily for the inhibition of rusting of the treated steel and also for the high adhesion of nickel deposits after a lengthy delay, the film protecting the steel surface from oxidation during the interval between etching and plating. As the adhesion value is high, it would appear that the film is removed upon immersion of the specimen in the plating bath, although, since destruction of the film must require a measurable time, it would presumably dissolve more rapidly in a bath of low pH than in a high pH solution. This is supported by the experimental results in which it was found that, starting deposition in the usual manner by immersing the specimen before making connection to the cathode bar, a solution of low pH gave good adhesion while one of high pH gave poor adhesion. It followed that, particularly for high pH solutions, the technique of making cathode connection before immersion, which

is often considered desirable to obtain maximum adhesion with conventional methods of etching, may be suitable with the present method.

### Summary

Aqueous solutions of oxalic acid and hydrogen peroxide, together with small concentrations of sulphuric acid normally present as stabilizer in the peroxide, have been found to exert a pronounced smoothing action on various types of steel. A suitable solution has the composition:

Oxalic acid (crystals) .....	2.5 g. per 100 ml.
Hydrogen peroxide .....	1.3 g. " "
Sulphuric acid .....	0.01 g. " "

Stronger solutions having the above ratio of constituents may be used, but they offer the risk of local furrowing of the steel surface due to convection currents caused by the greater activity of these solutions. Using the standard dilute solution at room temperature, the rate of attack upon mild steel is of the order of  $0.4 \times 10^{-3}$ " per hour. Agitation, increase of temperature and increase of concentration cause higher rates of attack. With mild steel and white heart malleable cast iron a considerable degree of polish is produced, while with V10 and V11 alloy steels and grey cast iron smoothing and, in the case of the steels, some brightening occurs. With V11 steel, the rate of attack is about  $0.28 \times 10^{-3}$ " per hour.

In preliminary quantitative investigation of the smoothing effect, it has been found that, while there is a general levelling tendency, coarsely ground surfaces with textures of 10 and 20 microinches are not completely smoothed with times of treatment up to 90 minutes. It appears probable that finer textures, of the order of 5-10 microinches, may be smoothed within this period.

Steel smoothed by this method is in suitable condition to receive strongly adherent electrodeposits of nickel. Qualitative tests indicate very strong adhesion to mild steel, while quantitative experiments with V10 alloy steel have given values of about 50 tons per sq. in. With alloy steels and grey cast iron, the smut resulting from the attack by the solution must be removed in order to obtain the strongest adhesion.

The surface of steel after treatment in the smoothing solution is covered with a thin protective film which markedly inhibits rusting upon exposure. This film appears to dissolve rapidly upon immersion of the steel in nickel plating solutions of low pH (e.g. 3.0), but with less acid nickel solutions (e.g. pH 5.5) the removal of the film is less rapid; commencement of deposition before removal of the film in these cases may result in very low adhesion values. The presence of the film upon the treated steel allows a much longer delay between smoothing and commencement of deposition than is permissible with conventional etching methods. Thus, delays of 8 minutes have been found to be without measurable effect upon adhesion value.

The potential use of the treatment as a means of smoothing and polishing, without work-hardening, steel specimens for metallographic examination and its application to decorative plating as a method of securing strong adhesion of electrodeposits to ferrous materials without impairing finish have not been investigated.

### Acknowledgments

The author wishes to thank the Metrology Department, Fort Halstead, and in particular Mr. S. Brennan, who carried out the determinations of surface texture, thickness and flatness besides affording him the opportunity for much useful discussion. Acknowledgment is made to the Chief Scientist, Ministry of Supply, and to the Controller of H.M. Stationery Office for permission to publish this paper.

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### RADIOMETRIC EVALUATION

(Concluded from page 58)

chromic acid concentration but without added phosphoric acid.

3. The amount of desorption of the chromic acid by hot or cold water is a small percentage of the total adsorbed, indicating presence of a chemical adsorption on, or combination with, the phosphate coating.

4. The action of trichlorethylene vapor has little or no effect on the amount of chromic acid adsorbed.

Based on the results previously reported, it is recommended that the chromic acid rinse solution be made to contain 30 oz. of  $\text{CrO}_3$  per 100 gal. or an alternative concentration of 16 oz. of  $\text{CrO}_3$  and 16 oz. of  $\text{H}_3\text{PO}_4$  per 100 gal.

The authors wish to express their appreciation to their co-workers at the Rock Island Arsenal Laboratory for their assistance and to the Ordnance Corps, Research and Development Division of the Department of the Army and supervisory staff of the Laboratory for permission to publish the information in this paper.

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### PRODUCTION OF CAST NICKEL ANODES

By Edmund R. Theus

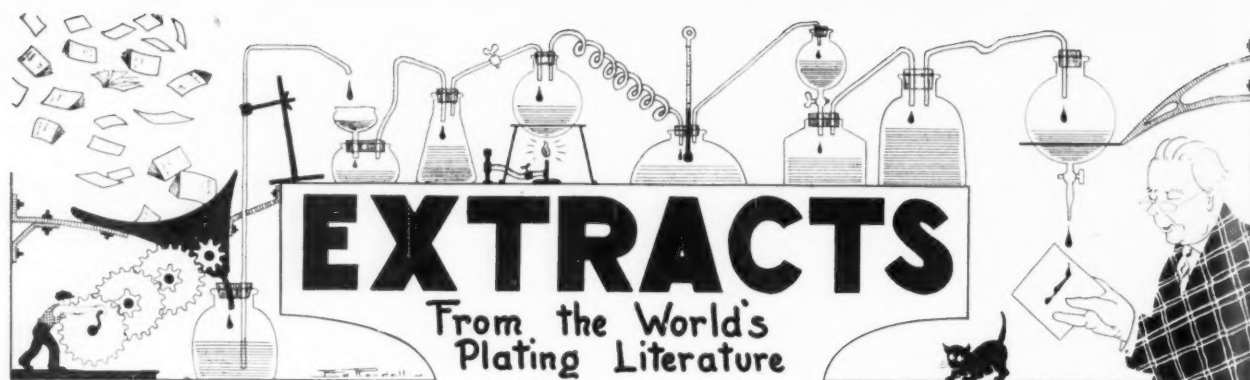
This article, which appeared in our September issue, should have been sub-titled "European Practice and Opinion," since it does not apply to cast nickel anodes offered for sales by suppliers in the United States and Canada.

Manufacturers of nickel anodes have communicated with the editor to this effect and Mr. A. C. West of Canadian Hanson & Van Winkle Co., Ltd., comments that the cast nickel anodes discussed are types which have long been discarded on this continent.

Readers of METAL FINISHING, in evaluating the opinions on cast and rolled nickel anodes presented by the author, should keep the above in mind.

Nathaniel Hall





### Faults in Chromium Plating and Their Avoidance

*Galvano* (Paris), vol. 21, No. 183, pp. 23-25.

Poor practice is to reduce the undercoat of nickel; this holds good for plating on copper or brass and still more so on steel. The theory is that possible flaking of the chromium is reduced with a thinner nickel plate but this is a fallacy. It is entirely a question of correct pretreatment of the surface. With a correct surface condition, thicker nickel plate will adhere as well as a thin coating. With an insufficiently thick undercoat for the chromium, the protective value of the plate is considerably impaired. The decorative chromium plate in itself has no corrosion protective value. Poor chromium plate (decorative plate) can often be ascribed to incorrect working schedules leading to bad plating practice. In some badly organized, smaller plating shops, it is often the practice to chromium plate only once or twice a week to reduce tank heating costs. The nickel plated parts which accrue in the meantime are stored and then treated in bulk when the chromium tank is started up. In the meantime the nickel oxidizes and this leads to poor adhesion of the chromium. The chromium plate should be deposited directly on freshly plated nickel to obtain satisfactory results. If it is absolutely necessary to work in this manner, before chroming, the nickel plated parts should be given a simple electrolytic degreasing to depassivate the nickel (about 10 to 15 seconds are required). As a further precaution, the parts proceeding from the alkaline degreasing stage, after two rinsings, are given a 2% hydrochloric acid dip.

Rinsing is again a source of trouble and again, mostly in the smaller plating shops with inadequate supervision. The first rinsing vat is often termed the "recuperative" vat, i.e. it is used to supply the make-up water for the chromium bath. This however is a serious fallacy and a false economy. The first rinse gradually accumulates impurities present in the drag-out from the chromium bath. A particularly bad case as an example is cited of processing of copper tubes; the chromic acid attacks the internal walls of the tube and copper enters the chromium bath and out in the drag-out. By the above method of working, this is in due course re-

turned to the chromium bath and there is a progressive build-up of copper, more than would otherwise be the case with normal operation. Grease, sawdust and other contaminants, present inside, also are trapped in the first rinse and passed back. The economy realized in returning the drag-out is in any case quite an illusory one. A case is given of the analysis of a first rinsing vat, after six months working in a large factory, where the chromium bath worked effectively five hours per day. The chromic acid content after this period was 6.5 g./L. which is a negligible figure, apart from the impurities present, as mentioned above.

Chromium plating of recessed parts sometimes presents difficulties. This trouble may be due to excess chromates, a poor ratio of chromic acid/sulfuric acid, impurities in excess, etc. It is possible to improve the throwing power on the recessed portions by two methods — to increase the spacing from the anodes and to pass the parts into the bath under current. It is a common error to place the parts, when trouble occurs, closer to the anodes. Placing farther away from the anodes gives a better distribution of the lines of force in the bath and so better metal distribution. If the recessed part is deep then an auxiliary anode must be used.

### Comparative Protection Afforded by Cadmium and Zinc Coatings

G. Schikorr; *Metalloberflaeche*, vol. 5, No. 12, pp. A 177 - A 185.

It is a generally accepted fact that cadmium coatings afford a better corrosion protection than do zinc coatings and this is in the main true. Cadmium has better non-tarnishing properties and has more resistance to sweat (condensed) moisture and to solutions of simple neutral salts, to alkalis and non-oxidizing acids. Zinc is superior to cadmium however for resistance to urban and industrial atmospheres. As no real definite information has been published regarding the protective behavior of a cadmium coating, the object of the present work was to provide data to clarify this point. The comparative quantitative tests which were made regarding the corrosion behavior of cadmium and zinc coatings, gave the following results:

1. Exposed to distilled water, moist gypsum, and a

spray mist of sodium chloride solution (salt spray test), the cadmium coatings were found to be much more stable than the zinc coatings; however, in an artificially prepared sea water solution, the superiority of the cadmium was only slight.

2. Moist air containing weak phenol and ammonia contents had only relatively slight actions on zinc and cadmium coatings, but the effect was greater on zinc.

3. Air containing appreciable amounts of acetic acid attacked the cadmium strongly, while zinc coatings in this case were found to be considerably more resistant. On the contrary, long exposure to air containing slight quantities of acetic acid was found to be less harmful to the cadmium coatings than to the zinc; however in all cases the corrosion was so considerable that the employment of zinc or cadmium coatings in locations where acetic acid vapors or those of the other lower fatty acids are given off, should be regarded as bad practice. The sensitivity of cadmium to acetic acid vapors is due to the strong hygroscopicity of the cadmium acetate.

4. The known low weathering resistance of cadmium coatings as compared with zinc coatings is due to the higher equivalent weight of the cadmium; this was shown by the simultaneous determination of the coating sulfur compounds with the corrosion.

5. As was anticipated, the long term protective value of cadmium is distinctly lower than that of zinc. This behavior can lead to the result that thin cadmium coatings in distilled water will lead to the commencement of rusting considerably earlier than with a sodium chloride salt spray solution test. Accordingly, with the cadmium plating of parts which are subject to the danger of water condensation attack, care must be taken that in such cases the cadmium coating amounts to at least 6 to 8 microns thickness.

A simple corrosion test to be recommended which can be easily conducted for the testing of cadmium plated steel and which gives information as to whether the coating is too thin or whether the cadmium coating is non-uniform, consists in immersing the test pieces in distilled water for some days.

Gilbert and Hadden of the British Non-Ferrous Metals Research Association have conducted similar research. These workers investigated in detail the attack of the lower fatty acids on cadmium deposits and no doubt remained as to the damage which results from this attack on a cadmium coating. This confirms the findings made above. Gilbert and Hadden did not investigate the effect of moisture sweating (condensation).

#### Comparative Investigations on Electropolishing Efficiencies of a Phosphoric-Sulfuric Acid Electrolyte and Acetic-Perchloric Acid Electrolytes

J. Heyes; *MetallOberflaeche*, vol. 5, No. 12, pp. B 179 - B 181.

The phosphoric-sulfuric acid and acetic-perchloric acid electropolishing baths are the two which have assumed the greatest technical importance and the object of the present research was to establish which was the most favorable of these two electropolishing bath compositions for industrial use. The comparison

of working effectiveness was made on the basis of the surface upgrading effect achieved, as this is the working feature of an electropolishing bath in industrial practice. The technical literature does not give any indication which of these two baths it is best to employ from this standpoint.

Available information would seem to show that in the electropolishing of the austenitic chromium and chromium-nickel steels about the same working results are obtained from these two baths. It is a different question however when steels with a heterogeneous structure are being processed. It has been previously pointed out by Heyes and Fischer (*MetallOberflaeche*, vol. 4, pp. 33-44) that, when electropolishing these steels with the acetic-perchloric acid electrolyte, the surface temperature must be kept as low as possible as otherwise the steel surface will be etched. The present work was arranged to test whether with phosphoric-sulfuric acid electrolytes, which have to be worked at bath temperatures of about 70°C., this surface etching effect would be absent.

The composition of the respective electrolytes was as follows: (1) 20%  $H_2SO_4$  + 80%  $H_3PO_4$  and (2) 76.4% acetic anhydride + 18.5% perchloric acid (sp. gr. 1.70) + 5.1% water. The surface of the test pieces was produced by fine surface grinding after turning. The results obtained are presented in the text in the form of tables and curves and the summarized conclusions from these data are as follows. The current densities with the phosphoric-sulfuric acid electrolytes were a little over 30 amp./sq. dm. while with the acetic-perchloric acid electrolytes current densities of about 2 amp./sq. dm. were used; the loss in weight of the test pieces (50 mm. diam. by 10 mm. long) was 20-350 mg. and the corresponding thickness reduction between 1.8 and 29 microns. There existed a considerable difference between the two electrolytes in the anodic current efficiency. While this was between 39 and 50% with the phosphoric-sulfuric acid electrolytes, with the acetic-perchloric acid electrolytes it achieved values of over 90%.

The surface finishing value at the beginning of the test, on the finely ground test pieces, showed values of 0.336. Under the influence of the polishing treatment in the phosphoric-sulfuric acid bath, it improved fairly steadily to a value of 0.100. The test samples treated in the acetic-perchloric acid bath showed a more rapid improvement in the surface quality and, when 5 microns had been electropolished away, the surface quality figure had almost reached the same value as was shown by the test pieces in the phosphoric-sulfuric acid bath after 28 microns had been removed. When, in the case of the perchloric acid bath, the dissolved layer had attained a thickness of about 20 microns then a continuation of the electropolishing treatment led to no further improvement.

From the curves shown, which represent the relation between the surface quality and the thickness reduction of the pieces treated, the conclusion can be drawn that the removal of the surface roughness peaks in the acetic-perchloric acid electrolytes proceeds more strongly than with the phosphoric-sulfuric acid electrolytes so that the levelling of the metal proceeds more quickly. Regarding the effect of the iron build-up in the bath on the electropolishing, Eilender and co-work-

ers have stated that with the phosphoric-sulfuric acid electrolyte, when a content of 12 g./L. of iron is reached the electrolyte becomes unusable. With the acetic-perchloric acid electrolytes, electropolishing is still possible in a bath which has attained 100 g./L. of dissolved iron.

### Electropolishing of Brass

J. Daurat: *La Metallurgie*, vol. 84, No. 5, pp. 363-365.

Electropolishing is applicable both to brass and other copper alloys as well as to certain special alloys obtained at a high temperature. Although with the normal diluted phosphoric acid baths the metal takes a remarkable brilliancy, the degree of polish is improved to a mirror effect by the addition of organic compounds to the electropolishing bath, favoring the formation of an anodic film. The bath recommended for series electropolishing of small pressed brass parts of irregular contour is as follows. This bath is recommended as it is said to give a brilliant sparkling polish to such parts:

Phosphoric acid 85%	41.5%
Glycerol	24.9%
Ethylene glycol	16.6%
Lactic acid 85%	8.3%
Water	8.7%

It should be noticed in this formulation also the addition of foreign bodies not used in ordinary baths which, although incorporated in a small proportion, have the object not only of effecting a higher surface polish but also of facilitating the polishing appreciably round the angles of contoured shapes and more generally, with objects with a small radius of curvature, or of those parts which are placed in the bath at points spaced some distance away from the cathode. Without giving even an incomplete list of these addition products, mention can be made of masmetol, amino acids such as glycine and glutamic acid and the amines such as ethylene diamine, monoethylamine and triethylamine.

If the desired result is a mirror polish with a high reflective power, glutamic acid and monosodium glutamate are perhaps to be preferred as the addition products. It should be emphasized that the concentration of these substances should be rather low. In actual fact, the degree of polish will deteriorate with too high concentrations of these addition agents and the reflective power will pass by a maximum for a relatively low concentration of these addition elements. In order to utilize to the best advantage the characteristics of the formation of an anodic film of high viscosity around the objects to be polished a certain control of the average thickness of the film is rational and desirable. The way which proffers itself as the most simple means to put into practice this postulation is to agitate the bath methodically to agitate the articles being polished which are immersed in the bath, with a displacement speed tangential to a movement of circular entrainment. Affairs then proceed as if a current of liquid of laminated flow was being impelled to circulate around the objects gliding upwards without turbulence, and this is obtained in fact by low linear speeds.

To achieve this, the articles to be polished are sus-

pended by iron wires on the circumference of a hoop serving as a support. This hoop is rotated by an actuating pulley. The optimum driving speed which produces the best polishing conditions in the shortest time, is determined by experience. Too high a speed and consequently too rapid a current, has a tendency to wash away the film or even to wipe like a duster, which has an adverse effect on the polish or can even prevent it altogether. On the other hand, too slow a rotation speed and consequently too slow a current of liquid, can cause a longitudinal attack on the anodic electrodes and increase the time necessary to obtain the desired polish. Consequently, for parts of average size, one obtains once and for all by methodical preliminary experiments the best working conditions. As regards quite small sized parts (less than a centimeter of principal dimension), they are often easy to polish without having the least mechanical movement in the bath. Heat convectional currents and gaseous convection are sufficient here. Regarding bath conditions, tests were made on anodic electropolishing of brass test pieces, 4.5 cm. square, the temperature of the electropolishing bath being maintained between 25° and 30°C., and the current density being 2 amps. per test piece. The influence of the liquid agitation is clearly shown by the following data. The limiting distance was obtained by the Walton reflectometer method.

Conditions	Limiting Distance
1. Specimens stationary in bath and current nil	5 cm.
2. Specimens rotated	12 cm.
3. Optimum concentration of glutamate with specimens rotated	21 cm.

By the Walton method, the surface reflective power is represented by the limiting distance and the best results are given by (3) with the greatest limiting distance factor.

### LEAD CLAD COPPER

(Concluded from page 66)

and no difference in its functioning under these conditions has been observed.

When it is considered that the lead-clad copper coil has efficiently handled the heavy Btu. input found during anodizing and kept the electrolyte at a constant temperature of 25°F. with ease and, when it is realized that during the test check on the cooling of sulphuric acid, Btu's were removed at the rate of 1 200,000 per hour, it should be evident to all engineers who are faced with severe cooling problems that they may well consider and investigate the use of this type of coil under the direct expansion of Freon.

It may be of interest to mention that the installation was designed to prevent harm to the compressor, in the event that a leak occurred in the coil at any time. This was done by raising the level of the inlet and outlet well above the solution level in the tank, so that the coil would function as a trap, in case of leak. The installation was equipped with a customary low pressure control on the suction line of the compressor, so that if a leak should occur the low pressure control would cut out the operation of the compressor.



## Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

### Barrel Silver Plating

**Question:** We have a large quantity of small flat pieces to silver plate and we wonder if these can be barrel plated.

**Answer:** Barrel silver plating can be done, after a fashion, using a solution of 1 oz./gallon silver cyanide and 6 oz./gallon sodium cyanide. However, flat pieces will probably stick together and some will fail to plate. It is suggested that spherical objects be plated in with the flat stock to tumble and break these apart while plating.

### Brightener in Silver Bath

**Question:** Your April issue has an article on "Silver Plating" by Mr. J. B. Mohler. In this article mention is made of the use of sodium thiosulfate for smoothing the silver deposit.

Will the use of this addition agent result in an appreciably harder deposit, hard enough to affect the final buffing or coloring of the article plated? Will it have any effect on the throwing power of the bath?

We are using the same silver bath for industrial and decorative plating and wish to add sodium thiosulfate in an attempt to improve our heavy deposit. However, we are wondering how it would affect our silverware plating operations.

W. J. M.

**Answer:** There is no objection to using a brightener in silver baths employed for industrial plating. However, we would suggest that you use ammonium thiosulfate rather than sodium thiosulfate.

All bright deposits are harder than dull deposits of the same metal so far as we know. However, this results in a surface which can be buffed or colored to a high finish more readily without dragging. The brightener will

have no noticeable effect on the throwing power. In the case of most bright deposits, flowing under the wheel to fill in scratches and die marks in the base metal is poor, but in the case of silver deposits, you will not have trouble. Since a dull silver deposit often requires scratch-brushing before coloring to remove the smut and eliminate wheel drag, the scratches left by the brush require heavier coloring with consequent removal of silver deposit. When a brightener is employed in the plating bath the scratch brushing operation can be eliminated.

### Copper Sulfate Test

**Question:** Could you recommend the proper proportion of copper sulfate and acid to be used in a solution for layout work on steel, and to test for stainless steel?

M. J. H.

**Answer:** For layout work on steel the following copper sulfate solution will be satisfactory:

Copper sulfate	2 oz./gal.
Sulfuric acid	1 oz./gal.

This solution will also distinguish between carbon steel and stainless steel, as it will not precipitate metallic copper on the latter.

### Anodizing Small Parts in Bulk

**Question:** We have a problem in chromic acid anodizing. In the laboratory I do small lot anodizing jobs. I put the parts—nuts—in a small perforated aluminum can, screw the cover down so they are tight and then anodize.

Now with fairly large size nuts—say  $\frac{1}{4}$ " or larger, I get a good job of anodizing. But with small nuts, such as #4-40, I cannot seem to get satisfactory results.

It is necessary to do chromic acid anodizing as many of the parts have nylon inserts, which would be effected by sulfuric acid anodizing.

I wonder if you could offer any suggestions as to why my method works on large parts but not on small?

C. G. A.

**Answer:** Your success with large nuts and lack of it with small ones would lead us to suspect that there may be too much resistance between the individual pieces or insufficient circulation of the anodizing solution.

We would suggest that you try baskets of smaller diameter and with holes as large as possible. The spacing between the small nuts may be so small that solution cannot get in, in which case a wetting agent might be of help. Try the materials sold by supply houses to keep the spray down in chromium plating solutions as these wetting agents are most resistant to the oxidizing solution.

### Testing Thickness of Anodize

**Question:** Our company is interested in a quick means of production checking the thickness of sulphuric acid anodic coatings on aluminum alloys.

I recognize that the best test is the salt spray. However, I had in mind a test for the production department consisting of the dielectric strength of an anodic coating on the above-mentioned alloys in comparison to hours salt spray or thickness of the anodic film but have found nothing like the above-mentioned graph I described.

J. C. K.

**Answer:** The flux type thickness gauge manufactured by General Electric Co. would be the most convenient method if it will work on anodized aluminum.

You might also communicate with Kocour Co., 4803 So. St. Louis Ave., Chicago 32, Ill. Their electrolytic thickness testing apparatus might be suitable.

There is no correlation that we know

of between the dielectric strength and salt spray test resistance.

A good chemical test for thickness of oxide film is the weigh-strip-weigh method, employing a solution of 2.7 oz./gal. chromic acid and 4 fluid oz. per gallon phosphoric acid hot.

#### Tarnish Prevention of Brass

**Question:** We have been informed that a process either for plating brass or treating it after plating has been patented which requires no lacquering to protect the brass from tarnishing.

A small sample of this type of finish was given to us. Since it has all the characteristics of a brass plated part we assume that it was actually brass plated. There were no evidences of lacquer or any protective coating. We are unable to obtain any information concerning the process from any of our local sources of technical information.

If you can supply us with any information concerning this process we would appreciate it very much.

G. A. F.

**Answer:** We know of no process of plating brass so that it will be tarnish resistant.

A number of preparations have been marketed from time to time, generally based on chromates, in which brass is to be dipped. These have been of only limited value. A typical formula would contain about 6 oz./gal. sodium dichromate and 2 oz./gal. sodium ni-

trate made slightly alkaline. This solution can be used with or without current.

Thomas & Price developed a method involving electrolytic deposition of a film of beryllium oxide on surfaces back in 1939 but we do not know of it being employed commercially.

#### Hard Black on Brass

**Question:** We blacken brass parts chemically using one of several commercial preparations which are sold for that purpose.

Do you know of a process, perhaps one involving electroplating, which will produce a harder, more durable finish? It seems to us that we have seen some reference to Black Nickel possibly as preliminary or intermediate treatment, in connection with a harder, more durable black finish for brass.

C. W. K.

**Answer:** We believe that the proprietary preparations will give you the hardest finish, since the film is generally cupric oxide. Black nickel would not be harder and would have the disadvantage of requiring lacquering for protection.

If you wish to experiment you can try the following two procedures:

1. Immerse at above 175 de. F. in a solution containing:

Copper carbonate—1 lb.  
Ammonia—1 quart  
Water—3 quarts

2. Treat with reverse current at about 200 deg. F. in a solution of 1 lb. caustic soda in 1 gallon of water.

#### Electroforming Molds

**Question:** Our interest lies mainly in the electroforming of molds to be used for plastisol slush molding, and any information you may give us regarding this matter will be very much appreciated.

P. F.

**Answer:** The usual procedure for producing such molds is to apply a film of chemically reduced silver to the model by spraying or immersion, followed by acid copper plating to the desired thickness.

On pages 386 to 392 of the 1951 edition of the Metal Finishing Guidebook-Directory you will find information on the subject of plating on plastics by Dr. Harold Narcus, which should cover your requirements.

#### Coloring Steel Chalk-White

**Question:** Do you know of any method of finishing steel stove bolts so that they will have a durable chalk white color? Painting is unsatisfactory for our use.

J. W. O.

**Answer:** We know of no metal deposit which would have a chalk white color and be durable. Have you considered porcelain enamel?

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## Buffing Wheel

U. S. Patent 2,607,171, August 91, 1952, J. F. Leslie.

A buffing wheel comprising a rigid center plate of polygonal shape having a central mounting aperture, a plurality of fabric buffing members, an eye carried by each buffing member, an elongated inwardly return bent hook formed integrally with said plate at the center of each edge portion thereof, the marginal portion of said plate from which said hook projects being laterally off-set in inwardly spaced relation to the ends of each edge portion, said hook being positioned substantially centered in the plane of said plate whereby an eye interlocked therewith is positioned substantially in the plane of said plate and a centrally apertured and radially slit cardboard sheet bearing against said plate and marginally retained by said hooks.

## Electrolytic Polishing of Stainless Steel

U. S. Patent 2,607,722, August 19, 1952, J. F. Kreml, assignor to Armco Steel Corp.

In the production of an electrolytically polished stainless steel product, the art which comprises, subjecting the metal to anodic treatment in an electrolytic bath essentially consisting of 20% to 30% glycolic acid, 10% to 60% sulfuric acid and 2% to 35% water, all figures being by weight and based upon anhydrous acids.

## Cleaning Worked Magnesium Articles

U. S. Patent 2,607,739, August 19, 1952, H. K. De Long, assignor to The Dow Chemical Co.

A method of removing surface contaminants from articles of magnesium and its alloys which comprises subjecting the article to the action of a solution consisting of acetic acid and a water-soluble nitrate selected from the group consisting of the alkali metal nitrates, alkali earth metal nitrates, and ammonium nitrate dissolved in water,

the concentration of the acetic acid being 5 to 45 per cent by weight and the water-soluble nitrate producing an  $\text{NO}_3$  concentration of 1.5 to 12 per cent, at room temperature for a time sufficient to remove the surface contaminants.

## Porcelain Enamel Coating

U. S. Patent 2,354,0, August 26, 1952, G. H. McIntyre and M. G. Ammon.

The method of coating a steel article which comprises applying on such article a coating layer of from about  $\frac{1}{2}$  to about  $\frac{1}{4}$  ounce per square foot dry weight, of a feldspar-silica-borax containing porcelain enamel sheet steel ground coat which when applied at a dry weight of  $1\frac{1}{4}$  to  $1\frac{3}{4}$  ounces per square foot would fuse to a glassy surface when fired on a 20 gauge steel sheet for about 3 to 5 minutes at a temperature of from about 1560°F. to about 1580°F., this time range and this temperature range being the normal firing time and the normal maturing temperature when fusing said ground coat upon a steel sheet of about 20 gauge, then, while making allowance for the thickness or weight of the steel if differing from 20 gauge, firing the coated article [at from about 5 to 3 minutes at from about 1500°F. to about 1700°F.] at a temperature of about 50 to 100°F. above the normal maturing temperature of the coating and for a period of time approximately twice as long as the normal firing time of said coating when used as a ground coat, to first form iron oxides on the metal surface and then to absorb such oxides into the enamel coat to produce a substantially completely devitrified coating, said coating being characterized by its extreme thinness, high resistance to corrosion and tenacious adherence to the metal article.

## Buffing Wheel

U. S. Patent 2,608,035, August 26, 1952, J. V. Tullo.

A buffing element comprising an annular, laminated fabric buffing ring, a pair of opposed disks which consti-

tute a support for the buffing ring having a peripheral groove receiving the inner edge of the buffing ring, each of the disks having a centrally located shaft receiving hub, a web member surrounding said hub, a shoulder at the outer periphery of the web, a narrow annular flange extending beyond the shoulder in a plane parallel to and offset from the web and having a plurality of teeth at the outer periphery thereof, a plurality of uniformly spaced holes and a plurality of uniformly spaced outwardly extending ribs between the teeth and the shoulder, the web members having a plurality of concentrically arranged holes there-through adjacent to and extending through the shoulders, the holes through each of the webs of the opposed disks being in registration with each other and the holes in the flanges and the teeth being in staggered relationship, the inner periphery of the buffing ring being spaced from the shoulders of the disks and the teeth on the flanges penetrating the fabric thereof adjacent the inner periphery from opposite sides in staggered offset relationship.

## Apparatus for Adding Pickling Inhibitors

U. S. Patent 2,608,392, August 26, 1952, R. O. Bowman, assignor to National Steel Corp.

In combination with means including a series of pickling tanks for acid pickling ferrous metal, apparatus for continuously adding solid particles of inhibitor to the tanks, said apparatus comprising, a supply tank for holding a bath of slurry of inhibitor particles suspended in a liquid, means for agitating the slurry in the supply tank, a conduit defining a relatively larger passage having an inlet and an outlet communicating with the supply tank, pump means for circulating slurry from the supply tank through the conduit passage back to the supply tank under pressure, and a series of passage means, each defining a relatively smaller passage separately con-



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needed to the conduit passage and a corresponding one of the pickling tanks, for withdrawing slurry from the conduit and adding the slurry to the pickling tanks, each passage means terminating in an elongated tube of uniform size leading to the corresponding pickling tank and controlling the rate of flow to the pickling tank, the total cross-sectional passage area of all of the relatively smaller passages being less than the cross-sectional area of the conduit passage whereby only part of the slurry circulating through the conduit is withdrawn.

### Method of Uniting Parts by Electrodeposition

*U. S. Patent 2,608,529. August 26, 1952. S. F. Varian, assignor to The Sperry Corp.*

The method of forming a unitary structure composed of an assembly of mechanical parts which comprises the steps of assembling a plurality of parts in desired relative relationship, enclosing the assembly in a thin, rubber-like envelope conforming generally with the contour of the parts of said assembly, decreasing the gas pressure within said envelope to thereby cause said envelope to be distended over the surfaces of engagement of the parts of said assembly, applying to said envelope a relatively thin deposit of electrically conductive material, and thereafter building up said deposit a substantially rigid sheath by electroplating.

### Metallized Ceramic Coating Composition

*U. S. Patent 2,608,539. August 26, 1952. L. A. Bain, Jr., and H. E. Malone, assignors to Western Electric Co.*

A composition for forming an electrically conductive coating on dielectric sheets consisting of:

*Per cent by weight*

Silver particles	40 to 60
Lead borosilicate	2 to 6
Oil modified alkyd resin	4 to 15
Solvent for the alkyd resin	54 to 19

### Burnishing Machine

*U. S. Patent 2,608,803. Sept. 2, 1952. C. C. Kinker and J. J. Murtagh, assignors to Gerity-Michigan Corp.*

An article burnishing machine having a tank with its bottom inclined to a horizontal and adapted to hold a burnishing liquid in the lower side portion thereof, and to drain liquid to

said lower side portion from elevated portions of the tank bottom, a burnishing liquid in said tank, an endless article-carrying means movable through the tank and liquid therein on an incline substantially corresponding to that of the tank, and means operable to coat with and buff an article carried by said first means when the article is in said liquid.

#### Coated Abrasive Article and Method of Making

U. S. Patent 2,609,284. Sept. 2, 1952.  
L. R. Nestor, assignor to Minnesota Mining & Manufacturing Co.

A flexible abrasive article of the nature of sandpaper, having abrasive grits adhesively bonded to a flexible backing by a grit bonding coat and a surface sizing coat, said grit bonding coat comprising the alkali-converted oxidized starch product formed by oxidizing starch, at a temperature of at least about 30°F. but less than that required for gelatinization of the starch, to a predetermined end-point at a moderately acid pH value without substantially reducing its internal strength, and converting to a distinctly alkaline, viscous fluid adhesive mass of high bonding strength, having a viscosity of about 1000-8000 centipoises at a concentration of about 40-50% solids when measured at 45°C., by adding an active base from the class consisting of alkali metal hydroxides and sodium metasilicate in an amount equivalent to 9-16 parts of sodium hydroxide for each 100 parts of unoxidized starch, and said surface sizing comprising an alkalicatalyzed synthetic phenolic resin.

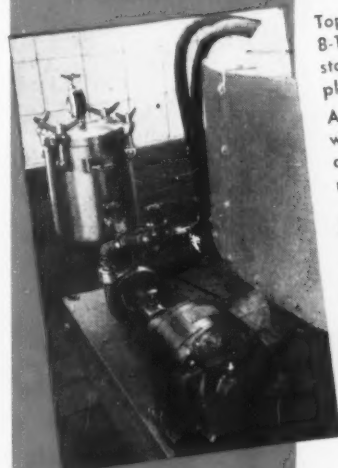
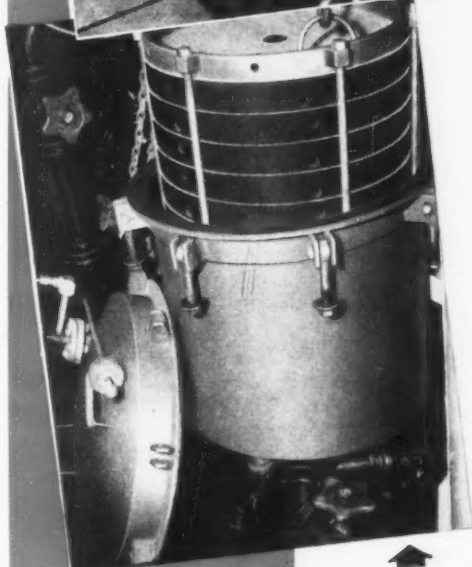
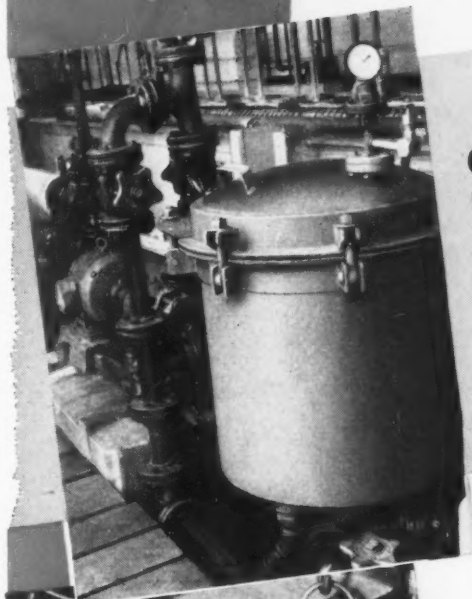
#### Phosphate Coatings

U. S. Patent 2,609,308. Sept. 2, 1952.  
R. C. Gibson, assignor to Parker Rust Proof Co.

The process of producing a phosphate coating on a ferrous surface, which consists in applying to the surface a solution consisting essentially of water, acid phosphate of an alkali metal and an oxidizing agent of the group consisting of nitrites, sulphites, chlorates and bromates of the alkali metals, the oxidizing agent being present in an amount having an effect on the quality and rate of coating on the said ferrous surface substantially equal to that produced by .5% to 4% chlorate, and the solution having a pH of

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Top: Sparkler Model 8-18 filter shown installed in Gillette's plating department.  
Above: Same filter, with filter plate assembly being removed for cleaning

Left: Sparkler Model 8-6 stainless steel filter. This portable unit is used by Gillette to filter gold plating solutions.

The kind of service Sparkler Horizontal Plate Filters have given the Gillette Safety Razor Company—efficient and trouble-free, even under most extreme conditions—is the kind of service that is vital to every filtering operation.

For example: A rubber-lined Sparkler Model 8-18 filter is used by Gillette in the continuous filtration of a 1000-gallon bright nickel plating solution. Now operating for approximately two years, this filter has been on a 24 hours a day, 7 days a week schedule—without any loss of operating time for repairs or maintenance. Also used in periodic batch carbon treatments of nickel solutions this unit, according to Gillette technicians, consistently delivers a brilliantly clear effluent, even though the plates may be packed solid.

Another Sparkler Filter employed by Gillette is a Model 8-6, stainless steel, portable unit. Used exclusively for cyanide type plating solutions, this Model 8-6 has proved particularly valuable for Gillette's gold plating operations since the patented Sparkler Scavenger Plate assures minimum loss of precious gold solution. Now operating almost six months for at least 2 hours daily, its performance has been satisfactory in every respect.

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brush element seated on said mandrel, said element comprising a plurality of helical turns of a channelform brush back having teeth punched inwardly from the sides thereof, a retaining member disposed longitudinally within said channelform back and held in place beneath said teeth, and brush material held in said channelform back by said retaining member; annular retaining members seated on said mandrel to either side of said helically wound brush element and provided with a plurality of circularly disposed teeth projecting in an axial direction adapted to indent and bear against the respective peripheral edges of the end-most turns of said helically wound channelform brush back; and a nut threaded on the end of said mandrel operative, upon being tightened, to bear against one of said toothed annular retaining members to force such teeth into such engagement with the edge of said brush back.

#### Processes of Brightening and Passivating Cadmium and Zinc

U. S. Patent 2,610,133. Sept. 9, 1952.  
E. A. Thomson, assignor to Radio Corp. of America.

A process of brightening and passivating a metallic surface of at least one substantially pure metal from the class consisting of cadmium and zinc, comprising treating said surface with an aqueous solution of nitric acid in which the acid concentration is about 0.1 to 3% by volume, then treating said surface with an aqueous solution consisting essentially of about 1 to 6 ounces of an alkali dichromate salt and about 1 to 8 ounces of a wetting agent per gallon of water, rinsing the treated surface, and drying, said process being carried out without permitting the article being treated to stand for any appreciable time between successive steps.

#### Rapid Fine-Grained Copper Electrodeposition

U. S. Patent 2,612,469. Sept. 30, 1952.  
E. F. Reisinger, assignor to The Wire Coating and Manufacturing Co.

An electrodeposition bath including copper cyanide, sodium hydroxide, and the reaction product of a sulphide of the group consisting of hydrogen sulphide and sodium sulphide on a diazotized primary arylamine of the group consisting of anthranilic acid, aniline, toluidines, xylydines, and benzylamine, said reaction product as a precipitate being dissolved in water containing triethanolamine.

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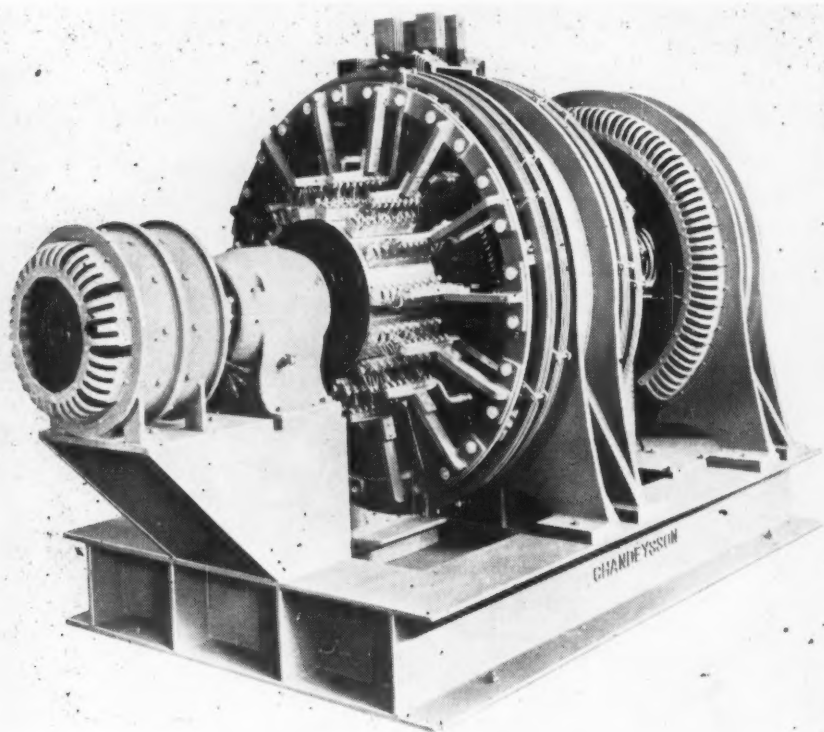


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Chandeysson Electric Co., Dept. MF, 4084 Bingham Ave., St. Louis 16, Mo.



Chandeysson Electric Company, designers and manufacturers of motor-generators for over fifty years, announces a complete re-design of its line of equipment. The new line features improved commutation, all-welded steel construction, increased accessibility and higher overall efficiency.

Generator and exciter brushes, coils, and commutator are now fully accessible for inspection, cleaning or removal, without the necessity of removing any other components. Higher overall efficiency is said to be realized with the new design which allows unrestricted air circulation around and through the generator. Field poles and windings can be removed from the generator or exciter easily and quickly by simply removing the two holding studs. The exciter brushes are mounted on the inboard side to prevent accidental damage and also to insure smoother operation, thereby increasing

brush life. Over-size split sleeve bearings adjacent to the commutators assure smooth operation and permit overloading without heating. Brush life is considerably increased with the new design which features sparkless commutation even at the guaranteed overload capacity of the generator.

The prime mover is a direct-connected low speed, heavy-duty, synchronous motor with either 30 per cent leading or unity power factor. Designed and built by Chandeysson, each motor is specifically designed to amply do the job required by the generator. High pull-out torque permits smooth and efficient operation even when the generator is overloaded. Extra windings on the rotor poles produce high-starting torque, permitting the use of across-the-line starting devices.

Chandeysson generators are available in sizes from 300 to 20,000 amperes at specified voltages.

### Electrolytic Alkaline Descaling Process

Enthone, Inc., Dept. MF, 442 Elm St., New Haven, Conn.

The company announces that their alkaline electrolytic process for derusting of metals will accomplish effective and complete scale removal of metals by the use of periodic reverse current.

The application of periodic reverse current, in which the work is made the anode from 5 to 30 seconds and then the cathode for a like period of time, has enabled effective, clean removal of black heat treat, quenching and other scales on steel and alloy steels more effectively than acid pickling. Bulk descaling of small parts has been successfully accomplished in oblique tumbling barrels using a carbon electrode. It has also been reported that the periodic reverse alkaline descaling process produces a better surface for hard chromium plating with less danger of hydrogen embrittlement than when acid descaling is done. The application of high current densities of the order of 100 to 500 amp./ft.<sup>2</sup> allows rapid scale removal from high carbon steel wire, accomplishing the descaling in from 1 to 2 minutes.

The use of periodic reverse current with the alkaline derusting process permits the removal of scale with the removal of carbon smut. The material for accomplishing electrolytic alkaline derusting and descaling is sold under the trade designation of Enthone Compound 134. It is used in a concentration ranging from 1-3 lbs./gal. Current densities can be employed ranging from 5 to several hundred amperes per square foot.

Further information can be secured in a technical bulletin by writing to the company.

### Semi-Portable Degreaser

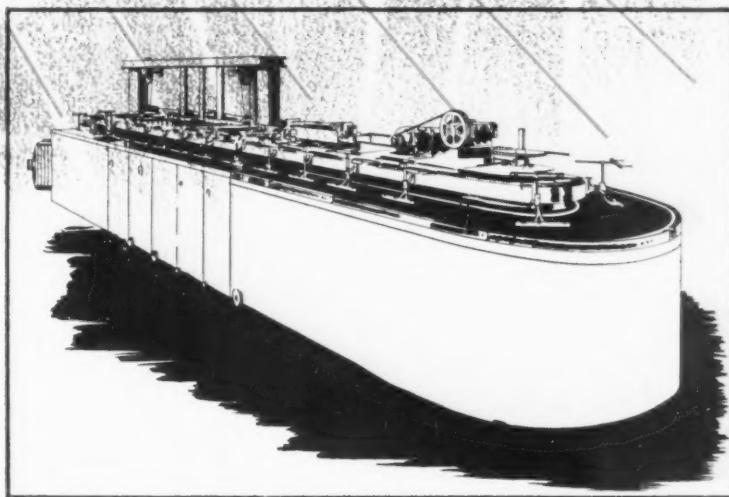
Detrex Corporation, Dept. MF, Detroit 32 Michigan.

A new VS Jr degreaser is announced by Detrex. This highly efficient, com-

# LEA

# Copper-Glo\*

- ★ produces a brilliant, soft, copper plate requiring no buffing to produce high color; it comes from the tank with adequate brilliance.
- ★ if smoothness is a factor and if the base metal itself is not buffed or polished, simple buffing of the Lea Copper-Glo coating will produce an excellent smooth finish without diminishing its inherent brilliance.



**W**HETHER you are interested in brilliance only or in brilliance plus smoothness in the copper plating phase, you can save in production time (and in plating material) by using Lea Copper-Glo. You cut production costs by eliminating entirely or reducing substantially prior grinding operations on either cast, forged, or spun pieces.

You can also save in tank time, perhaps as much as 50%, and still produce a deposit that will have excellent buffability.



Br., Buffing, Polishing, Plating and Spray Coating . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Learok . . . Industry's quality buffing compounds for over twenty-five years.

Lea Copper-Glo may be the answer to your problem of (1) producing a better copper plated surface and (2) reducing operating time. Why not investigate it NOW?

*Investigate* LEA CUPRALL for operations where ONLY BUFFABILITY rather than a combination of buffability and brightness is required. It's an all-purpose cyanide copper addition agent.

\*Ronol Bright Copper Process, using Lea Copper-Glo, is a development of Ronol Chemicals, Long Island City, N. Y.

## THE LEA MANUFACTURING CO.

16 Cherry Avenue, Waterbury 20, Conn.

LEA MFG. COMPANY OF CANADA, LTD.

370 Victoria Street, Toronto 2, Canada



## Use This Check List to Insure Effective...Low-Cost Electro-Cleaning

	YES	NO
Is It Safe For the Metal or Metals You Clean? (No Attack on the Metal)	✓	
Does It Clean Chemically as well as Electrolytically? (Speeding and improving the cleaning operation)	✓	
Can Its Solutions Carry High Current Densities? (Insuring fast, effective cleaning)	✓	
Can It Be Used for Either Anodic or Cathodic Cleaning? (Providing flexibility in the cleaning operation)	✓	
Does It Provide Long-Lived Solutions? (Assuring material improvement in cleaning costs)	✓	

There's no single electro-cleaning compound suitable for all metals. You've got to pick your cleaner to suit your particular operations.

### See That the Cleaner You Use Meets ALL Requirements

In the Magnus Line of Electro-cleaning Compounds there is a cleaner that is best qualified to insure fast, thorough, low-cost electro-cleaning for your product . . . whether it is an aluminum die-cast unit or an all-steel part. In selecting the one cleaner for your product, make sure that it qualifies on every count on the check list.

### Let Us Run Tests in Our Lab!

. . . using your actual products, with the Magnus Electro-cleaning Compounds applicable to its materials of construction, to determine the one material that will give you the best all-around results. Get in touch with us to arrange the details!

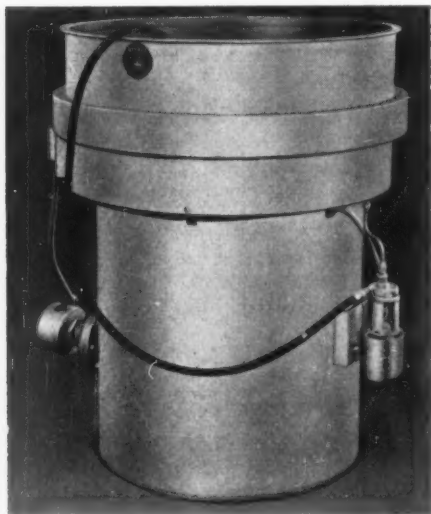
MAGNUS CHEMICAL CO. • 11 South Ave., Garwood, N. J.  
In Canada — Magnus Chemicals, Ltd., Montreal.  
Service representatives in principal cities.



# MAGNUS

CLEANERS • EQUIPMENT • METHODS

compact unit is designed to clean small and medium sized parts and is ideally suited for shops, laboratories and small



manufacturing plants where production up to 600 pounds of steel per hour must be degreased.

Two standard, manually operated models of the VS Jr are available. One is electrically heated, the other operates by steam. Both degreasers may be easily relocated at any time in various work areas as long as service facilities are available.

The VS Jr degreaser operates on the same long-established Detrex degreasing principle . . . parts are suspended in pure solvent vapor which rapidly dissolves soils in dirt and grease. A spray of hot solvent quickly flushes away any loose, stubborn soils which might remain. Finally, a rinse in pure solvent vapor leaves the work thoroughly clean and dry.

All work may be placed in baskets

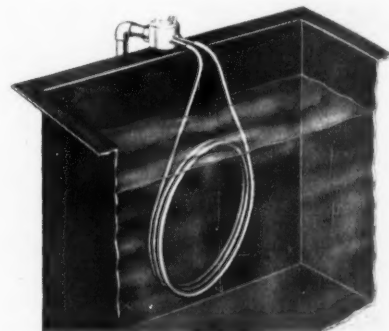
or on racks or hooks for quick, easy handling. Work may be carried in and out of a degreaser either by hand or a small hoist. The equipment is only 48 inches from the top to the base, affording a low, convenient working height.

The interior of the equipment is coated with Detrex FF-1, the new non-porous coating which is completely corrosion-proof and unaffected by degreasing solvents.

The VS Jr is extremely economical. It is low in initial cost as well as in operating and maintenance cost. Installation is simple and inexpensive. Just attach the water supply and plug in the electric model or connect a steam line to the steam operated model.

### Lead Sheathed Electric Immersion Heater

Edwin L. Wiegand Co., Dept. MF,  
7627 Thomas Blvd., Pittsburgh 8, Pa.



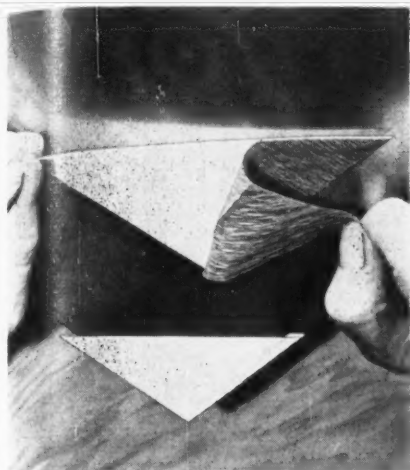
Design of a new immersion-type electric heating unit for electroplating baths has been announced. The CTL heater has a thick lead sheath which resists corrosive acid action of copper, chromium, and nickel solutions. Rated at 5 KW, on 230 volts, the heater has dimensions of 3 x 16 x 27 inches. Terminals are protected by a moisture-tight cast-iron housing. Separate thermostatic control is possible for fully automatic temperature regulation.

For more information about the CTL heater write to the Company, explaining your particular problem.

### Mystik Tape Helps Prevent Damage, Personal Injury

Mystik Adhesive Products, Dept. MF, 2635 N. Kildare Ave., Chicago 93, Ill.

Known as Mystik Brand "Self-Stik" Corner Protectors, these protective coverings are now widely used in industry to cover the sharp, dangerous corners of metal sheets and eliminate costly refinishing and replacements



caused by exposed corners accidentally scratching or damaging other materials. In addition, they are proving an efficient safeguard against personal injuries.

The protectors are made of a tough, rubberized fiber material cut in triangular-shaped pieces and scored for quick folding. They have a thin paper backing which peels off to expose the pressure-sensitive adhesive. When folded over the corners of metal sheets, they stay on securely during all phases of handling, fabricating, stacking, shipping and storage. On removal, they peel off quickly and easily without leaving any residue.

For further details and complete information write the above manufacturer.

#### Tumbling Barrel

The Hupp Corp., Globe Division, Dept. MF, 1250 West 76th St., Cleveland 2, O.

A flask-type, direct motor drive, tilting tumbling barrel developed by the company is said to be giving better work action for deburring and burnishing of all types of precision parts both ferrous and non-ferrous. The newest addition to Globe's complete line of tumbling barrels is said to magnify the conventional tumbling action due to the restrictive nature of the flask-shaped design.

The machine may be employed with all types of deburring and burnishing media and is available in sizes for loads ranging to 750 lbs. The flask-type barrel is constructed of continuous welded sections of heavy steel plate. A  $\frac{1}{4}$ -inch lining of abrasion-resistant rubber or Neoprene vulcanized to the barrel provides effective insulation to give longer life to the barrel shell while protecting parts against nicking

## GENERATORS..available now!

To provide additional space for building the ALL NEW Chandeysson motor generator (important — see pages 8 & 9) we offer for immediate sale\* and delivery the following 40°C. motor generator sets:

COMPLETE WITH DIRECT CONNECTED EXCITER and 220/440 volts — 3 phase — 60 cycle — unity power factor synchronous motor

1000 Amps — 9 Volts	4000 Amps — 9 Volts
1000 Amps — 12 Volts	6000 Amps — 6 Volts
1500 Amps — 6 Volts	7500 Amps — 6 Volts
1500 Amps — 12 Volts	7500 Amps — 9 Volts
2500 Amps — 6 Volts	7500 Amps — 12 Volts
2500 Amps — 12 Volts	7500 Amps — 25 Volts
3000 Amps — 9 Volts	10,000 Amps — 9 Volts
3000 Amps — 12 Volts	10,000 Amps — 25 Volts
	15,000 Amps — 12 Volts

All sets are new and carry the full Chandeysson guarantee. Write, wire or phone Chandeysson Electric Company, or your nearest Chandeysson distributor today.

\*SUBJECT TO PRIOR SALE.

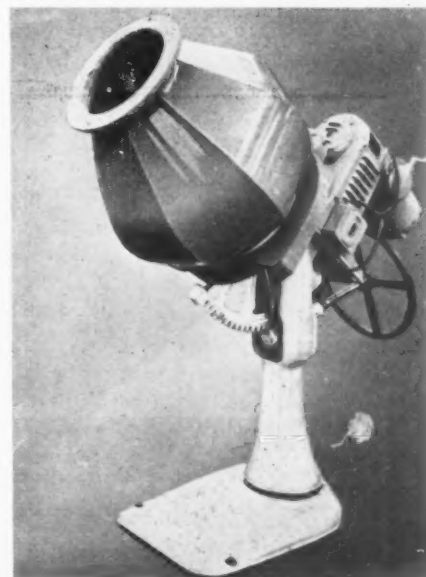
*Chandeysson* ELECTRIC  
COMPANY

4084 BINGHAM AVENUE • ST. LOUIS 16, MISSOURI

and scratching. Use of the lining permits the barrel to be used interchangeably for deburring and burnishing.

Direct drive is provided with a 1 h.p. motor mounted directly above the worm segment for balance and space economy. The units are available with either single or variable speed motors which drive the barrel through a gear reduction which permits maximum power to the barrel without overtaxing the motor.

The new flask-type barrel design is said to concentrate the load into a smaller working area, which increases the efficiency of the tumbling action. The tilting angle of the barrel may be adjusted to produce a smooth, tumbling action or a more violent one. By tilting the barrel to its horizontal axis, maximum agitation is obtained. As the



## Wheels CUT FASTER, LAST LONGER

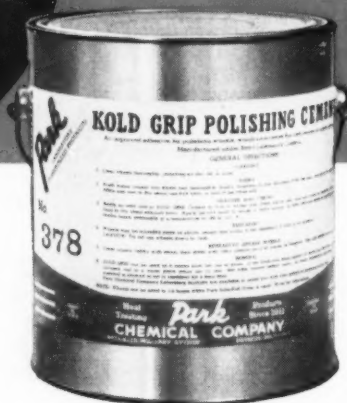


When treated with  
*Park*  
**KOLD-GRIP**  
POLISHING WHEEL CEMENT

**K**OLD-GRIP Polishing Wheel Cement, laboratory-controlled through every step of production, will arrive at your plant *ready for use!* Viscosity is constant, regardless of normal temperature variations and the cement can be applied directly from the container . . . *without mixing or heating.* Kold-Grip is clean, odorless and very easy to handle.

Coarse or fine-grain abrasives set up right for fast cutting efficiency. Substantial savings are effected through longer over-all wheel life, fewer set-ups and reduced wheel inventory.

Wheels dry rapidly, are unaffected by humidity changes, and may be stored in any convenient plant area.



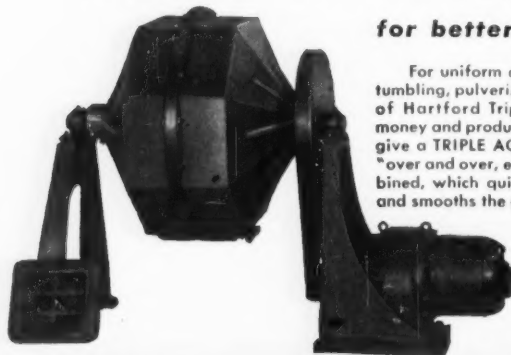
Let our polishing engineer demonstrate Kold-Grip for you, or send for free sample, telling us the metal to be polished, grain sizes to be used, and drying facilities available. We can help you if we hear from you.



• Liquid and Solid Carborizers • Cyanide, Neutral, and High Speed Steel Salts • Cokes • Lead Pot Carbons • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement  
LICENSED MANUFACTURER: Gorton Refractories Co., Ltd., Weybridge, Surrey, England

## HARTFORD TRIPLE ACTION

### CUTTING and TUMBLING BARRELS



for better work in less time!

For uniform cutting down, wet or dry grinding, tumbling, pulverizing and mixing, the unique design of Hartford Triple Action Barrels saves time and money and produces better results. Hartford Barrels give a TRIPLE ACTION in tumbling the material, an "over and over, end to end, folding-in" motion combined, which quickly grinds off burrs, and finishes and smooths the general surface of any article in the load. These barrels are available in two sizes, large and small, and with both motor and belt drive. Hartford also makes steel burnishing balls scientifically correct in design and material for each specific job. Bulletin on request.

**THE HARTFORD STEEL BALL CO.**  
HARTFORD 6, CONN.

DETROIT: W. S. TURNER, 445 NEW CENTER BLDG.  
CHICAGO: VICTOR B. CLARK, 605 N. WASHINGTON BLDG.  
NEWARK, N. J.: GUARANTEE TRUST BLDG., 977 BROAD ST.  
LOS ANGELES, CAL.: E. D. MALTBY CO., 1718 SOUTH FLOWER ST.  
EXPORT: R. A. RODRIGUEZ, INC., 55 W. 42ND ST., NEW YORK

2H582

barrel is raised towards its vertical axis, the violence of agitation is diminished for smoother action. The flask-type design affords the advantages of the motion of a horizontal barrel plus the added convenience of loading and unloading of the tilting type barrel.

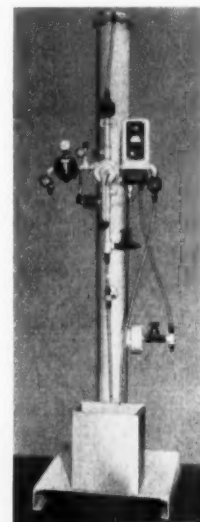
Construction of the flask-type Globe tumbling barrel includes a heavy cast iron base and special high-strength alloy pedestal that supports capacity loads in continuous service. The tilting mechanism employs a handwheel-operated worm gear that moves the tilting gear segment. A low gear ratio makes it easy to raise or lower the barrel even when loaded to its 750-lb. capacity.

All moving parts are lubricated through Alemite fittings, while bronze bushings are employed at all friction spots. Speeds of the flask-type barrel are available as low as 17 r.p.m. for non-ferrous and plastic parts to eliminate spoilage. Standard equipment includes variable speed motors to give speeds of from 10 to 35 r.p.m.

A free experimental metal finishing service offered by Hupp to improve quality or cut cost is available in connection with the new flask-type tumbling barrel. Upon receipt of parts to be processed and a finished sample showing the finish required, Hupp will furnish a complete report showing recommended abrasive media, procedures and equipment required.

## Exceptionally Compact, 100 GPH Mono-Column Demineralizer

Penfield Mfg. Co., Dept. MF, 19 High School Ave., Meriden, Conn.



This company has announced the addition to its line of industrial demineralizing equipment of a new Mono-Column Demineralizer with a capacity of 4,500 grains designed for users of up to 100 GPH of super high purity water.

As shown in the above picture, the new Penfield M-100 Demineralizer is exceptionally compact, requiring for its installation only 2' x 2' x 7' 6" of floor space, connection of influent to a plant's water system, and connection



of effluent to those points where high purity water is required (process, boiler feed, etc.).

Raw water enters the demineralizing unit at the influent and after passing only once through the mono-column of mixed cation and anion resins, is received at the effluent stripped of all its impurities. A flow meter on the influent enables the user to control the water intake for the most efficient ion exchange action and an electric purity meter provides continuous indication of the purity of the demineralized water being received at the effluent.

Thus, once a Penfield M-100 Demineralizer is set in operation, production of up to 100 GPH of super high purity water is accomplished completely automatically without the use of heat or steam power. Operating costs average only \$.15 to \$.30 per 1,000 gallons for mineral-free water the equivalent of triple-distilled.

When purity of the effluent falls below the desired standard, indicating the need for regeneration of the resins, such is accomplished in a single operation consuming under an hour of time by means of a uniquely simple regeneration system that is an integral part of the demineralizing unit.

The effluent lines carrying the demineralized water to desired points-of-use are plastic, as are all the lines and valves dealing with corrosive regeneratives. The unit's central control valve is acid-resisting bronze and all influent and distribution piping is red brass. In addition, this new model Penfield Demineralizer features an exclusive "visual window" design which allows the removal of the unit's central distribution system without emptying the column of its resins.

Complete catalog information may be secured by writing Mr. Edward H. Clohessy, general manager of the above company.

### Rust Inhibitor For Wet Blasting Machines

American Wheelabrator & Equipment Corp., Dept. MF, 150 South Byrkit St., Mishawaka, Ind.

The company announces that Anarust, a liquid rust inhibitor for wet blasting machines, is available from stock. The material is of organic composition, and it contains no chromates. It is completely soluble in hard or soft water at 20°C. and it produces a clear colorless solution, which is stated to be odorless, non-irritating to the skin, and

not subject to bacterial decomposition. It produces no foaming when put into solution, and keeps water staining to a minimum on ferrous parts which are rinsed in it. The specific gravity is about 1.0 at 20°C.

When used at the rate of approximately 1/2 ounce per gallon of water, it is claimed to be a very effective agent in retarding rusting on cast iron or steel parts which are being cleaned and washed after wet blasting. It can also be safely used on parts prior to undergoing such operations as plating, enameling, painting, etc.

### Steam Cleaner

Clayton Mfg. Co., Dept. MF, El Monte, Calif.

Designed originally for use at Armed Services bases around the world, and now made available in a "civilian" model for the first time, development of the extra heavy-duty and high capacity BOE-600S Clayton Kerrick steam cleaner is announced by the above company.

The new machine, capable of discharging up to 540 gallons per hour of pressure detergent spray and up to 540

**A COMPLETE LINE OF METAL FINISHING EQUIPMENT**

We can supply all the equipment necessary for a complete modern metal finishing plant.

PICKLE & DEBURRI & CLEANING  
PLATING  
SPRAYING  
BAKING  
POLISHING

**IMMEDIATE DELIVERY**  
Write for our Free Color "E" and Descriptive Literature

**J. HOLLAND & SONS, INC.**  
276 46TH ST., BROOKLYN 11, N. Y.  
ALICE 7-3314-5-6

## A TUMBLING BARREL FOR EVERY PURPOSE

Yes . . . Henderson can supply you with tumbling equipment in a variety of sizes, shapes and materials for practically every tumbling requirement. Nearly three quarters of a century in designing and manufacturing tumbling barrels for the GRINDING, BURNISHING, POLISHING and CLEANING of metal stampings, balls, bearing races, forgings, small castings, screw machine products, jewelry, wire forms and small metal parts. Tilting type barrels of Steel, Wood or Alloy Metal . . . Horizontal type barrels of Cast Iron or Cast Steel. Wood or rubber lined in all Models. Also special barrels for plastics.



#5A Motor Driven Tilting Oblique Tumbling Barrel.



Two-compartment wood-lined Burnishing Barrel.

If your requirements call for faster production and finer quality at lower cost or if you require Tumbling Barrels of special design, our Development and Engineering Service will be glad to make recommendations.

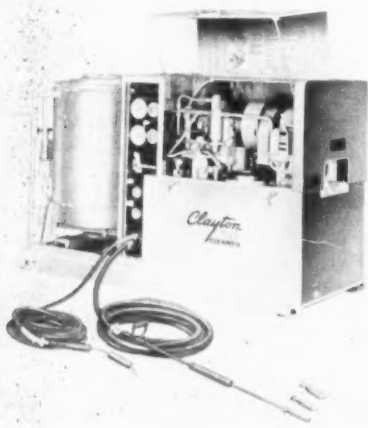
Write for further information.

Since 1880 - Designers and Builders of Tumbling Barrel Equipment

**THE HENDERSON BROS. COMPANY**

135 SOUTH LEONARD ST. | WATERBURY 85, CONN.

gallons per hour of hot or cold pressure rinse simultaneously, offers virtually double the cleaning capacity of standard steam cleaning equipment. The BOE-600S is designed to solve the



cleaning problem in any operation requiring large scale cleaning.

Equipped with a 60 gallon detergent concentrate tank and a 40 gallon fuel tank, the new steam cleaner will operate for 4 hours continuously at maximum load, and for many additional hours at lesser loads, without replenishment of the detergent or fuel supplies.

The vapor generator operates with a thermal efficiency in excess of 80% under all operating loads, while the pressure atomizing burner system, equipped with safety switch control, operates efficiently on common, low-cost fuels, offering a choice of kerosene, fuel oil, distillates, or gasoline. Economy in the utilization of the detergent is assured by means of an accurate detergent metering device

which maintains the detergent-water ratio at the level found most effective for rapid, thorough cleaning.

The machine is supplied complete with a specially insulated cleaning gun, a rinse gun, two sets of delivery hoses, and 150 feet of heavy duty electrical cable. The equipment operates on 220 volt, 60 cycle, single phase current. It stands 43" high, 88" long 34" wide. Weight, with storage tanks empty is 2,000 pounds.

### Mixing & Storage Tanks

Reco Sales Co., Dept. MF, 70 East 45th St., New York City.



New features available in their line of stainless steel chemical mixing and storage tanks — features never before found in tanks designed for laboratory and industrial use, are claimed.

Chief of these features is an inverted air-seal cover which fits closely against the sides of the round tank and actually floats on top of its contents — thus eliminated is the danger of contamination, evaporation and oxidation. Over a 90-day test period, it was claimed that oxidation of solutions stored in these tanks amounted to as little as 1%.

These floating covers are made of transparent, chemically inert resin which makes it possible to visually check the tanks' contents at all times. If any entrapped air bubbles should be observed, a mere spin of the cover will send them to the outer edge where they are freed.

By adding circulating pumps and jets to these tanks, vortex-free mixing of chemicals can be accomplished. With floating cover in place, air can be completely excluded during mixing operation. Another interesting feature of these versatile tanks is a precisely machined, stainless steel, spring-closing spigot which dispenses liquids by merely flicking the handle downward. Sup-

plied with a Neoprene "O" ring valve seal, spigot may be completely disassembled and assembled in a matter of seconds. Cleaning problems are thus kept to a minimum.

Available in various sizes from 10 to 600 gallons, the joints and seams of these "type 316" stainless steel tanks are flush — Heliarc welded and passivated.

## Manufacturers' Literature

### New Coating Bulletin

*The Ceilcote Company, Dept. MF, 1332 Ridge Road, Cleveland 9, O.*

The above concern has issued a six-page bulletin on Ceilcrete, their corrosion proof coating. Its properties and uses are described, instructions given for mixing and applying, and a chemical resistance chart is also included.

### Complete Line of Metal Cleaning Equipment

*Topper Equipment Co., Dept. MF, Clark Township (Rahway) N. J.*

A new 4-page bulletin describing the complete line of Circo metal cleaning equipment has just been issued.

The bulletin describes and illustrates vapor degreasers, vapor spray degreasers, liquid-liquid-vapor degreasers, pit type and conveyorized degreasers.

Many features of the line are described in the bulletin such as all equipment being suitable for operation with either perchlorethylene or trichlorethylene degreasing solvents.

Also described are recovery stills, power spray washers, portable hydro-spray cleaners and Circo degreasing solvents.

### Rhodium Data Sheet

*Technic, Inc., Dept. MF, P. O. Box 965, Providence 1, R. I.*

The company has issued a compilation of data under the title "Electroplated Rhodium." Believed to be the most complete listing of electrical and physical properties of rhodium ever assembled for ready reference in one place, the data sheet also details factors of corrosion resistance, hardness electroplated, electroplating specifications, and rhodium thickness requirements for different purposes. Free copies are available from the above company.



## BLAKESLEE degreasers use less solvent.

ECONOMY is the key to Blakeslee Solvent Vapor Degreasers. Comparison proves that through patented construction and operational features you save more on solvent—gives you lower production costs. "Use less solvent to clean parts of any size or shape."

Write today for  
full information

**G. S. BLAKESLEE & CO.**  
CHICAGO • NEW YORK • TORONTO

**BLACOSOLV** the  
highest stabilized  
degreasing  
solvent

1844 So. 52nd Ave.  
CHICAGO 50, ILL.

**SOLVENT VAPOR DEGREASERS**  
in standard or special  
conveyor  
models

CANADA  
**G. S. BLAKESLEE & CO., LTD.**  
18 Cranfield Rd.  
TORONTO 13, ONTARIO

**NIAGARA-METAL PARTS  
WASHERS—built  
to fit your  
needs**

### Notes on Nickel Plating from a Fluoborate Bath

*International Nickel Co., Inc., Dept. MF, 67 Wall St., New York 5, N. Y.*

6 pages, tables and references. Describes a tough ductile and relatively low stress deposit from a fluoborate bath, whose high buffering capacity and good conductivity make it attractive for rapid plating of heavy deposits. An easily controlled process that produces good adhesion of nickel to steel and copper surfaces.

### Corrosion-Resistant Linings

*The U. S. Stoneware Co., Dept. MF, 60 East 42nd St., New York, N. Y.*

This 12-page, 2 color, fully illustrated bulletin presents the complete his-

tory of Tygon as a lining and covering material. It discusses Tygon's composition . . . physical forms . . . physical properties . . . where and how to apply it. Extensive tables give a thorough picture of Tygon's chemical resistance. Comparisons with various types of lining materials are made. Methods of preparation, application, maintenance and repair of mechanical damages are also presented.

### A Complete Guide to Successful Silver Brazing

*The American Platinum Works, Dept. MF, 231 New Jersey Railroad Ave., Newark 5, N. J.*

Requests for the 48-page illustrated brazing manual are continuing at a



# Bonus Performance

**Filtering any plating solution . . .  
any quantity**

**INDUSTRIAL**

**Filters**

Portable and stationary models. Capacities from 100 to 15,000 gph. Special filtering systems engineered to meet unusual conditions.



## and it's performance that counts

The engineering, design, and construction of INDUSTRIAL filters have proved out in long service. With the outlet near the top of the chamber, a uniform precoat is deposited on the filter leaves as the solution fills the chamber. The outside lockup simplifies the lockup of the leaf and bag assemblies. INDUSTRIAL exclusive air-wash cleaning method practically eliminates the usual labor, downtime, and the inconveniences of dismantling the filter after each cycle. INDUSTRIAL filters are often in operation for months without removing the cover. All these features add up to bonus performance—clear filtrate at low over-all cost per gallon.



### Ask for Bulletin 100-EP

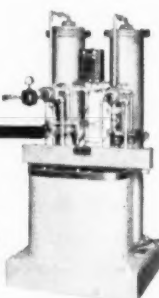
This bulletin gives the complete details of all INDUSTRIAL features, description of the different standard models, and the capacities of the standard sizes.

## INDUSTRIAL Water Demineralizers

**Eliminate stains after hot rinses; prevent unwanted precipitates in solutions.**

Standard INDUSTRIAL demineralizer units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.

**Write for Full Information and Recommendations**



## INDUSTRIAL FILTER & PUMP MFG. CO.

5906 Ogden Avenue  
Chicago 50, Illinois

FILTERS Pressure Type	PUMPS Centrifugal	CORROSION TESTING APPARATUS Salt Fog • Humidity	
		RUBBER DIVISION Vulcanized Linings • Molded Products	WATER DEMINERALIZERS

rate that has just required the publication of a second large edition this year.

The booklet is the most complete guide available for all aspects of silver brazing applications and procedures. It provides correct answers to all general questions on low temperature silver brazing, brazing alloys, joint design, preformed brazing shapes, plymetals, fluxing, heating methods, cleaning and inspection. More than 50 drawings and charts are used to illustrate the text. Several of the reference charts have been found to be particularly useful in selecting specifications for silver brazing alloys, to check U. S. Government Specifications and for Conversion data. There is also a specially designed graph that is used to calculate quickly, the thermal expansion of metals at the various silver brazing temperatures.

Copies of Silvaloy's "A Complete Guide to Successful Silver Brazing" are again available without charge to engineering and brazing personnel of industrial manufacturers, libraries, schools, etc., upon request to the above company.

### Complete Line of Washers

*Detrex Corporation, Dept. MF, Box 501, Detroit 32, Mich.*

An eight-page, three-color booklet which describes in detail their complete line of industrial washers is offered by the company.

The booklet is profusely illustrated with actual photographs of equipment ranging from single-stage, totally enclosed cabinet washers to huge, five-stage phosphate coating and paint bonding machines.

The operational advantages of "one-source efficiency" are described in the Detrex washer booklet. Also included are some general washer operating hints that will be of valuable assistance to plants using alkali or emulsion washers in their production cleaning line.

### New Rolock Catalog on Fabricated Alloys

*Rolock Incorporated, Dept. MF, Fairfield, Conn.*

The manufacturer has issued a new catalog, No. B-9 (Corrosion Resistant Section). This section describes and pictures baskets, racks, crates, tanks, sinks and special equipment for degreasing, cleaning, dipping, galvanizing, pickling, quenching, and other

processing operations. Every type of basket, centrifugal, trunnion, drop-bottom, rotating (manual and motor-driven) is shown, including many unusual shapes and designs for specific duties.

Of special interest to manufacturers of steel shell cases are the new type of work-holder baskets, which serve through automatic cycles of many operations, after the cupping operation, and through the final draw. Included is Rolock's new articulated "Serpentine" grid, designed to retain its shape under severe exposures . . . as a tray or basket bottom.

Copies of B-9 Catalog are obtainable from the above address.

#### Metal Recovery by Ion Exchange

*The Permutit Co., Dept. MF, 330 West 42nd St., New York 36, N. Y.*

One of the fields in which ion exchange holds great promise is in the recovery of valuable metals. In a vast number of manufacturing processes, dilute solutions are produced containing metals whose recovery would be most attractive.

Valuable information on the subject is contained in a 9-page reprint of a talk "Metal Recovery By Ion Exchange" given by *C. F. Paulson*, the company's special applications engineer.

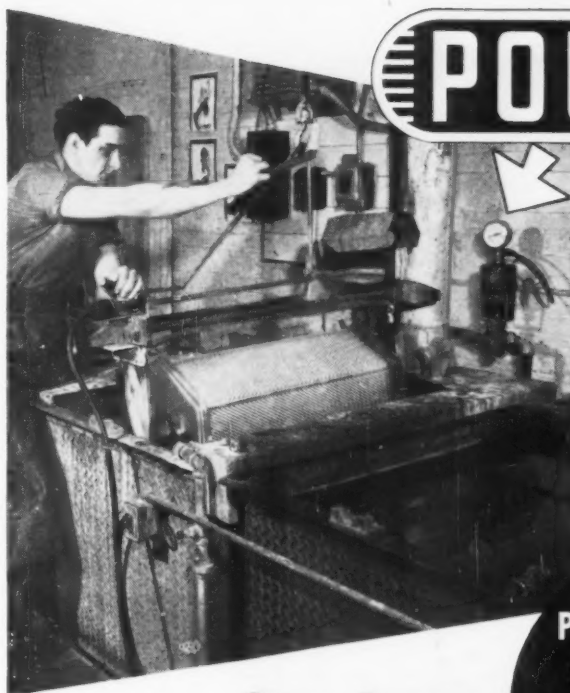
Tables, charts and other data illustrate some of the forms in which industrially important metals are present in solutions and how they might be economically recovered.

#### Sheet and Plate Fabrication

*The Kirk & Blum Mfg. Co., Dept. MF, Forrer St., Cincinnati 9, O.*

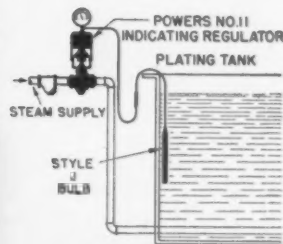
A new brochure has been issued by the above company. It contains over 40 pages of illustrations of the Kirk & Blum fabricating plant and manufacturing facilities. The booklet also gives a comprehensive view of many of the typical parts and products the firm regularly manufactures.

The products illustrated are made from galvanized and black sheet steel, a wide range of alloys including aluminum and stainless, plate up to  $\frac{1}{2}$ " thickness and light structurals. Broad classifications cover: breechings and casings, factory equipment, machine bases, guards, cabinets and boxes, stampings, concrete forms, transportation equipment parts, tanks, plating equipment, appliance parts, electrical



# POWERS

## TEMPERATURE CONTROL



### **Stops Losses Caused by OVER-Heating**

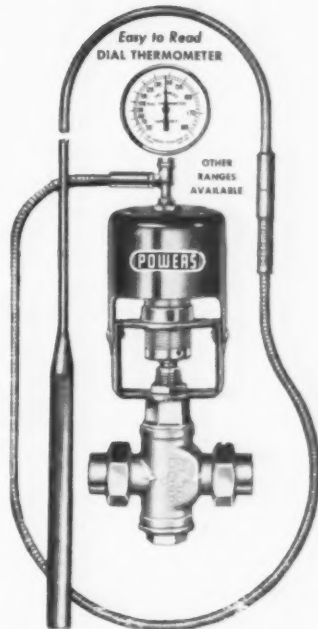
Stop human errors, mechanize temperature control of plating operations with **POWERS No. 11 INDICATING REGULATORS**. They maintain a constant temperature, are self-operating and easy to install.

**Easy to Read Dial Thermometer** indicates temperature in tank. Thermostatic bulb is lead sheathed or made of stainless steel. Powers regulators are gradual acting and ruggedly built to give the dependable control required for good plating.

**Will Help You Get a Better Product at Lower Cost** Better temperature control of plating solutions will help reduce rough plating, buffing time, insure plating within the bright range and reduce decomposition of solutions. Powers regulators pay back their cost many times a year. They are—

**SIMPLE • ECONOMICAL • DEPENDABLE**

**In  
PLATING, CLEANING  
and RINSE TANKS  
METAL PARTS WASHERS  
DEGREASERS  
ANODIZING, BONDERIZING  
AND PICKLING  
TANKS**



**Phone or write our nearest office for specifications and prices  
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LOS ANGELES 5, CAL. 1808 West Eighth St. Phone Drexel 2394  
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**THE POWERS REGULATOR CO.**

OFFICES IN 30 CITIES • SEE YOUR PHONE BOOK

**Over 55 Years of Temperature and Humidity Control**



**CONTROLS?**

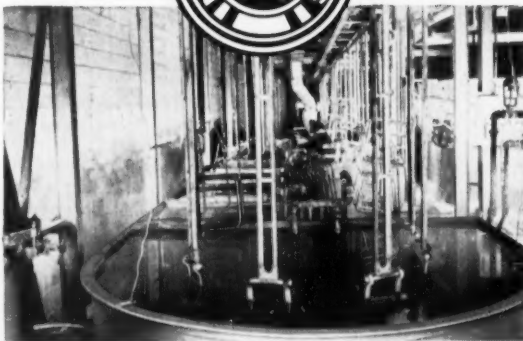
Put them  
**INTO** your  
Plating!

## Get more and better plating for less

With complete control of the sequence plus the conveyor handling of the parts, a Meaker machine gives greater production, reduced costs, uniform predetermined quality and less turnover in personnel due to better working conditions. Meaker equipment is tailored to the job requirements in plating, anodizing, pickling and cleaning, bonderizing or other processes involving a sequence of washes, rinses, and dips. Get full particulars from The Meaker Company, 1635 South 55th Avenue, Chicago 50, Illinois.

# MEAKER

- ☐ Full Automatic and Semi-Automatic Electroplating Equipment
- ☐ Strip Steel Plating Equipment
- ☐ Wire Galvanizing Equipment
- ☐ Strip Steel Electrocleaning Lines
- ☐ Pickling Machines
- ☐ Processing Conveyors
- ☐ Motor Generators for Plating
- ☐ Rectifiers for Plating



Meaker Return-Type  
Automatic Plating Machine

PLATING EQUIPMENT FOR OVER 50 YEARS

enclosures and factory trucks.

Plant data covers: shearing, contour cutting, punching, stamping, forming, welding, assembly, structural fabrication, warehousing and shipping departments.

Copies of the catalog are available on request.

### Life is Good in Kalamazoo

*Hammond Machinery Builders, Inc.,  
Dept. MF, 1600 Douglas Ave., Kalamazoo, Mich.*

This company has issued an unusual booklet entitled "Life is Good in Kalamazoo" in celebration of its 70th Anniversary.

It is a refreshing change from the stereotyped, tells so relatively little about the company's past or, in fact, about its products, and so much about Kalamazoo in text and picture, that we suggest it will prove interesting to any reader regardless of whether he is engaged in management, engineering, production or advertising.

Copies of this booklet are available by writing to the above address.

## BUSINESS ITEMS

### Perma-Line Appointments

J. W. Blaydes, president of the Perma-Line Rubber Products Corp. of Chicago, has announced the appointment of G. Gordon Schmuck as sales manager. Mr. Schmuck left his position as district manager with a national manufacturer of acid proof materials



G. Gordon Schmuck





C. F. Bellm, Jr.

to join the Perma-Line organization two years ago. Because of his past experience in the corrosion field, he has been able to increase sales of the company's materials and services with companies not previously served.

A recent addition to the Perma-Line sales force is C. F. Bellm, Jr. Mr. Bellm, having spent fifteen years in the plating field as a job shop owner, is very familiar with, and well qualified to discuss problems of the electroplating industry.

#### Carborundum Appoints Imirie

The appointment of Joseph S. Imirie to the newly created position of assistant to the president, has been announced by Clinton F. Robinson, president of The Carborundum Co., Niagara Falls, N. Y.

In his new position, Mr. Imirie will render staff assistance to the president and executive vice-president in the general management of the business of the company and will assist in the development and promulgation of company objectives, policies, organization structure and programs.

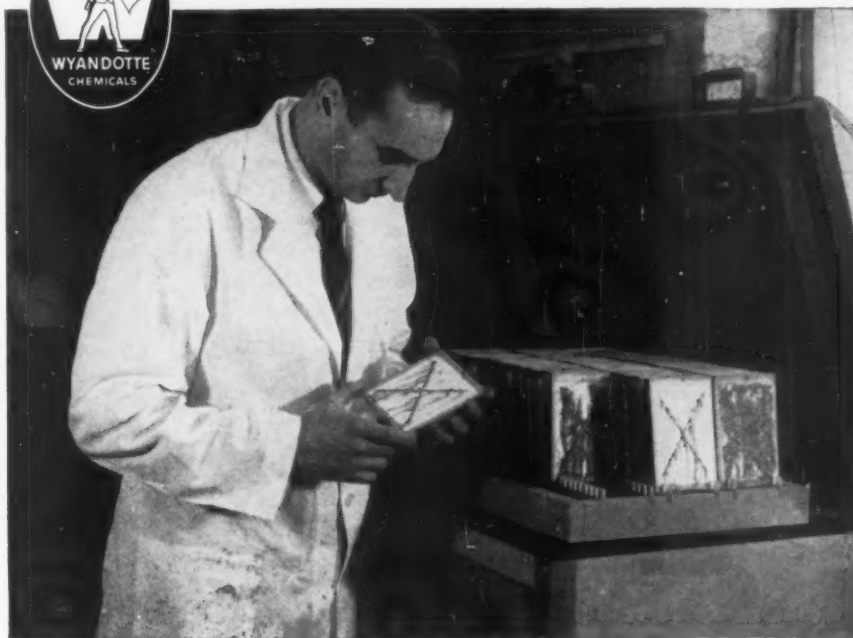
Mr. Imirie has been with the company since January 1952, serving in the investigation of new products to be added to the company's present line.

A native of Washington, D. C., he attended the public schools there, and in 1933 graduated from Catholic University with a Bachelor of Science Degree in Business Administration.

He has since served the Government in a number of important Air Force administrative functions. These include assignments in the Office of the Deputy Chief of Staff, Operations; Office of Air Force Management Control; and Office of the Deputy Chief



## Specialists in Industrial Cleaning Products



After 432 hours in salt spray, corrosion has just begun on PRE-Fos-processed steel.

## "Phosphating cleaner consumption cut 25%!"

### —PRE-Fos field report

And here are more field reports:

"We can run one to two weeks longer before dumping!" "Humidity cabinet resistance improved 80%!" "Best cleaning our washer has ever produced!"

Everywhere users are hailing the unchallenged superiority of Wyandotte PRE-Fos\*, the sensational new phosphating cleaner that cleans; deposits a fine-grained phosphate coating—an ideal paint base; and prevents rust of in-process steel parts.

**PRE-FOS performs in hard or soft**

water, can be used in spray washer or soak tank and has long solution life. It rinses freely and completely; does not corrode mild steel equipment; reduces sludging.

Read the comparative tests on PRE-Fos and four competitive products, below. Then investigate this great, new cleaner! And be sure to write us for help with any of your cleaning problems. We'll be happy to serve you. Wyandotte Chemicals Corporation, Wyandotte, Michigan; also Los Angeles 54, California.

\*Reg. U. S. Pat. Off.



	Hours to failure in salt spray	Spray washer cleaning rating	Soak cleaning rating
	Panels spray processed 3 minutes, 2 oz. gal., 35 lbs. sq. in. pressure, 160°F. Finished with appliance white enamel and baked; paint thickness 0.0007 inches.	2 oz. gal., 25 lbs. sq. in. pressure, 160°F., drawing compound and heavy oil soils.	4 oz. gal., 170°F., no agitation, mixed and mineral oil soils, 10-minute immersion.
<b>Product</b>			
<b>A</b>	<b>failed—408 hours</b>	<b>fair</b>	<b>fair</b>
<b>B</b>	<b>failed—120 hours</b>	<b>fair</b>	<b>fair</b>
<b>C</b>	<b>failed—192 hours</b>	<b>good</b>	<b>good</b>
<b>D</b>	<b>failed—240 hours</b>	<b>poor</b>	<b>poor</b>
<b>Pre-Fos</b>	<b>no failure—420 hours</b>	<b>excellent</b>	<b>excellent</b>

**THE WYANDOTTE LINE**—products for burnishing and burring, vat, electro, steam gun, washing machine and emulsion cleaning, paint stripping, acid pickling, related surface treatments and spray-booth compounds. An all-purpose floor absorbent: Zorball. In fact, specialized products for every cleaning need.

**Largest manufacturers of specialized cleaning products for business and industry**



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Helpful service representatives in 88 cities in the U.S. and Canada



UNIFORM  
FINISH

FASTER  
PLATING

ALL SHAPES  
AND SIZES

**HUSSEY**  
*Pure Copper*  
**ANODES**

Here are the basic tools for real craftsmanship in electroplating. Available in a full range of shapes and sizes, Hussey Pure Copper Anodes assure uniform finish and fast, dependable plating.

OUR 104th YEAR

**C. G. HUSSEY & COMPANY**  
(Division of Copper Range Co.)  
ROLLING MILLS AND GENERAL OFFICES, PITTSBURGH 19, PA.  
7 Convenient Warehouses to serve you promptly!

PITTSBURGH..... 2850 Second Avenue	CHICAGO..... 3900 N. Elston Avenue
CLEVELAND..... 5318 St. Clair Avenue	ST. LOUIS..... 1620 Delmar Boulevard
NEW YORK..... 140 Sixth Avenue	PHILADELPHIA, 1632 Fairmount Avenue
CINCINNATI..... 424 Commercial Square	

of Staff, Materiel. During World War II, he saw active duty with the Air Force, and attained the rank of major.

Prior to joining The Carborundum Co., Mr. Imirie was Deputy Under Secretary of the Air Force.

#### Solomon R. Baker Elected President of Pyrene

Solomon R. Baker, of Worcester, Mass., and Beverly Hills, Calif., has been elected president of *Pyrene Mfg. Co.* of Newark, N. J., it was announced recently. *Pyro, Inc.*, of which Mr. Baker is also president, purchased a majority stock interest in the well-known manufacturer of fire fighting equipment a few months ago. Mr. Baker is senior partner of Baker and Baker, Certified Public Accountants, of

Worcester, Mass., and is a member of the American Institute of Accountants.

Announcement was also made of the recent election to the Pyrene Board of Directors of *Abraham M. Sonabend*, of Boston, Mass., *Samuel Botwinik* of New Haven, Conn., and *Wilbur A. Cowett* of New York City.

#### Industrial Filter and Pump Appoints R. F. Ledford

R. F. (Ray) Ledford has been appointed director of sales and research, *Industrial Filter & Pump Mfg. Co.*, 5900 Ogden Ave., Chicago 50, Ill., according to an announcement by *Ralph E. Liedberg*, vice-president and general manager. Mr. Ledford was formerly superintendent of finish, *Sun-*



R. F. Ledford

*beam Corp.*, and prior to that sales engineer, *Hanson-Van Winkle-Mun-ning Co.* He is president of the Chicago branch and member of the research committee A.E.S., also a member of the Electrochemical Society and American Society for Testing Materials.

#### Young Purchases the Apley N. Austin Co.

Dr. C. B. F. Young, well-known consulting electrometallurgist, has purchased the *Apley N. Austin Co.* of Pequabuck, Conn. This company manufactures a complete line of polishing and buffing compounds and also manufactures alkali cleaners.

Dr. Young will devote his time to the improvement of the firm's products and Mr. Austin will continue to function in his capacity as Vice-President and General Manager of the company which he founded some twenty-five years ago.

#### Beckman Builds New Eastern Plant

*Beckman Instruments, Inc.*, South Pasadena, Calif. manufacturer of scientific and industrial instruments and precision components comprising a line from pH meters to computers, has started construction on a new 20,000 square-foot building in Mountainside, N. J.

To be used as Eastern sales and service offices for the parent company and as an Eastern manufacturing facility for the Beckman subsidiary, *Helipot Corp.*, manufacturer of helical potentiometers, the new plant will be of brick one story high and will incorporate the latest design features for precision manufacturing.

It will be located on a two-acre plot beside the main highway leading to New York. Beckman estimates more than 150 people will be employed in the new plant.

#### Hanson-Van Winkle-Munning Sponsors Fellowship at Michigan State College

Hanson-Van Winkle-Munning Co., Matawan, N. J. announces the sponsorship of a graduate fellowship as part of its continuing long-range policy of promoting the study of fundamental research in electroplating and allied fields. Joseph M. Tobin is the new fellow, elected by the faculty at Michigan State College. He will study the "Diffusion Rates of Gases Through Metal Films."

Administration of the fellowship is under the direction of Dr. D. T. Ewing of Michigan State College. Russell H. Fay, recipient of the fellowship for the past three years, is now a teaching assistant in the College's Physical Chemistry Department.

#### National Research Appoints Sylvester

Harold C. Weingartner, vice-president and general manager of National Research Corp.'s Equipment Division, announced the appointment of Russell L. Sylvester as manager of engineering and chief engineer of the division. Mr. Sylvester has been with National Research since February, 1952. He will be concerned with the activities of the division which is a large supplier of high vacuum equipment and plant installations employed in the electronics, metallurgical, chemical, dehydration, and coating industries.

Prior to his association with National Research Corp., Mr. Sylvester was the owner and manager of the Rollins Engine Co. of Nashua, N. H., builders of special machine tools, paper converting equipment, and automatic machinery. His background also includes work with the Norton Company of Worcester, Mass., and the Souhegan Mills, Wilton, N. H. He attended the University of New Hampshire and Northeastern University and is a registered professional engineer. He is a resident of Nashua, New Hampshire.

#### Rapid Electric Appoints LaMantia

Rapid Electric Co., announces the appointment of Frank LaMantia as Chief Purchasing Agent for the company. One of his chief responsibilities in this position will be the coordination



**OUTSTANDING DEVELOPMENTS IN PRECIOUS METAL PLATING**

**SOL-U-SALTS**

<b>GOLD</b> (Potassium Gold Cyanide)	<b>SILVER</b> (Potassium Silver Cyanide)
<b>NICKEL</b> (Potassium Nickel Cyanide)	<b>COPPER</b> (Potassium Copper Cyanide)
<b>CADMIUM</b> (Potassium Cadmium Cyanide)	

**BRIGHT GOLD PROCESS**

**IN EVERY INSTANCE WHERE SEL-REX SILVER SOL-U-SALT WAS INTRODUCED IT WAS ADOPTED AS STANDARD.**

SEL-REX SOL-U-SALTS are water soluble in pure crystalline form. Eliminates old-fashioned mixing, calculating or filtering. No objectionable dirt or dust.

SEL-REX BRIGHT GOLD SALTS produces "mirror-bright" deposits in any thickness without scratch brushing and/or buffing. Uses conventional equipment. Solution is stable and easily maintained.

Write Dept. MF-12 for details on complete line of SEL-REX Gold, Silver, Nickel, Copper, Cadmium and Rhodium Salts and Solutions. Ample stocks for immediate delivery.



**SEL-REX PRECIOUS METALS, INC.**

229 Main Street • Belleville 9, N. J.



Frank LaMantia

of procurement with production schedules.

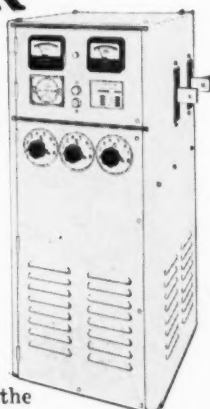
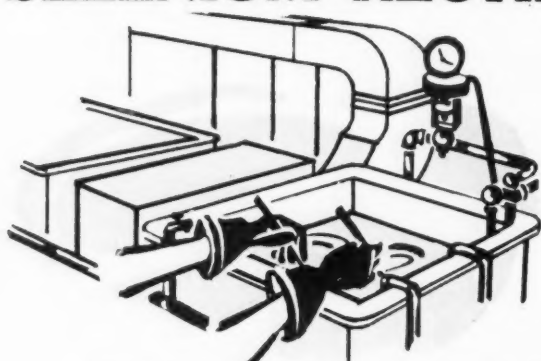
Mr. LaMantia has had broad educational training and practical experience in business administration. His previous employment was with the New York Central System, where he served in several responsible capacities over a period of eleven years.

#### Arrow Plating Co., Inc., Opens New Job Shop

The grand opening of Arrow Plating Company, Inc., at 2155 Wabansia Ave., Chicago, Ill., took place on September 27, 1952. Five integrated buildings covering more than 30,000 square feet of floor space have given the company "breathing room" within which to house every type of custom electro-



# No Guesswork Here . . . It comes out right **RICHARDSON-ALLEN SELENIUM RECTIFIER**



When "it comes out right" consistently, you know the satisfying result — greater output, highest quality, fewer rejects, lower labor costs.

This profitable achievement depends not only on your own skill and ability. It also requires and deserves the most dependable rectifying equipment.

You can assure the dependability of your d c supply by installing Richardson-Allen Selenium Rectifiers which have established records in hundreds of plants for long, trouble-free service.

The Richardson-Allen line includes various types and the widest selection of voltages and currents. For example, all models may be standard or plus rated; there is a choice of basic and remote controls; self-contained; heat exchanger; sequence programming controls; anodizing, and also suitable equipment for manodizing.

There is an R-A factory representative in most major cities. If you do not find him in your phone book, write directly to us.

## **RICHARDSON-ALLEN CORPORATION**

a manufacturing affiliate of  
WESLEY BLOCK AND COMPANY, 39-15 MAIN ST., FLUSHING, N. Y.  
IN CANADA: Richardson-Allen of Canada, Ltd., 370 Victoria St., Toronto, Ont.



**SET IT and FORGET IT**



Left to right: Fr. James A. Vanderpool, of Wonder Lake, Illinois, extends congratulations to the family of John E. Carlson, President of Arrow Plating Company, Inc., Chicago, Illinois. (Group is as follows: Fr. Vanderpool, Mrs. Anna V. Carlson, Mary Ann Hollerbach, (partially hidden from camera), John E. Carlson, Mrs. John E. Carlson and John William Carlson.)

plating service. Thirty-foot ceilings are aluminum insulated and amply sky-lighted for ventilation and natural sunlight.

Arrow Plating Company, Inc. was founded in 1909 by the late John P. (Pete) Carlson, one of the pioneers of the job shop electroplating industry. In moving to its present location the company has doubled its physical facilities.

## **American Rack Appoints Kurdenck**



**John Kurdenck**

William Zube, president of Naraco's Chicago plant, *The American Rack Company*, announces the appointment of John Kurdenck as sales manager, who brings to American Rack his extensive experience in design and technical use of plating racks and fixtures.

## **Graver Tank Awards Building Contract**

The *Graver Tank & Mfg. Co., Inc.*, of East Chicago, Ind., manufacturer of steel and alloy tanks and vessels, has awarded a contract to the *Luria Engineering Co.* of New York and Bethlehem, Pa., for a new fabricating and manufacturing plant to be erected at Evansville, Wyo., according to an announcement by the engineering company.

The plant, scheduled for completion next January, will be a standardized, steel-frame structure with 16,000 sq. ft. of floor area. One story high, it will be equipped with an overhead crane runway, with a 10-ton load capacity, at a rail height of 25 feet.

The building will be 80 feet wide, 200 feet long and have steel roofing and siding.

## Udylite Appoints Giere

Appointment of *John E. Giere* to the Udylite Cleveland regional sales staff was announced by *L. V. Nagle*, Udylite Corporation vice-president in charge of sales.

Prior to joining Udylite in Detroit in May, 1951, Giere was graduated from the University of Detroit. He formerly resided in Fort Wayne, Ind., where he attended high school, graduating in 1942.



John E. Giere

During World War II, Giere served with the U. S. Navy in the Pacific theater.

## Ferro Corporation Appointments

The appointment of *Dr. Glenn H. McIntyre* and *Orville O. Kenworthy* to new key posts with the Ferro Corp. was announced recently by *George W. Wallace*, vice-president in charge of operations.

Dr. McIntyre was named technical director of the corporation and Mr. Kenworthy was appointed director of research. In his new position, Dr. McIntyre, who will also continue in his present post as vice-president of the corporation, will supervise the technical work of all branches, divisions and subsidiaries of Ferro, which manufactures porcelain enamel frit and allied industrial equipment.

Both men have occupied important posts with Ferro prior to their present appointments. Dr. McIntyre came to Ferro in 1927 after completing a fellowship at Western Reserve University sponsored by one of the founders of Ferro. He served as chief chemist and research director, and in 1947 was elected vice-president in charge of re-

# EXTREME Versatility

for Lower Finishing Costs



## CLAIR SURFACE FINISHING MACHINES

A versatile Clair Surface Finishing Machine may be the answer to economical, production-quality surface finishing of your products. Combining the "touch" of the old time craftsmen with extreme versatility and high speed production, Clair Surface Finishing Machines are soundly engineered and ruggedly built.

By cooperative counsel between your engineers and Clair designers, custom surface finishing equipment may be developed to give maximum efficiency and economy on your metal finishing operation.

May we show how Clair Surface Finishing Machines can save money for you? Write for technical data.



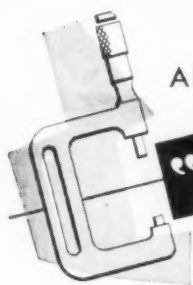
SPECIALIZED MACHINE EQUIPMENT FOR GLAZING AND POLISHING OPERATIONS  
OLEAN, N. Y.



Dr. Glenn H. McIntyre



Orville O. Kenworthy

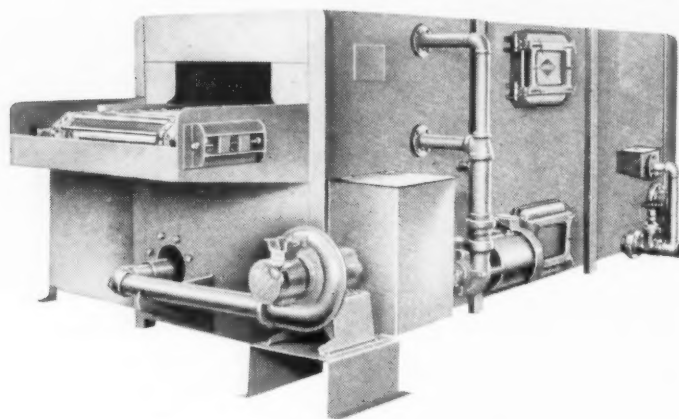


ANOTHER

**"JOB ENGINEERED"**

**ALVEY-FERGUSON**

WASHING MACHINE FOR INDUSTRY



WHEN a washing machine is needed to perform an unusual operation, it's almost certain that A-F Engineers will be called upon to build it! . . . The A-F Washing Machine shown here was built especially for removing sand from steel foundry

flasks. A special feature is the Slo-Flo Tank (not shown in photograph) which settles the sand out of the cleaning solution before it reaches the screening tank for recirculation. Flasks are cleaned faster . . . and each flask is **uniformly clean!**



For a discussion of latest metal parts and products cleaning methods, write today!

**THE ALVEY-FERGUSON COMPANY** 205 Disney St. Cincinnati 9, Ohio  
OFFICES OR REPRESENTATIVES IN PRINCIPAL CITIES

search. He occupied the latter position until his present appointment.

Mr. Kenworthy joined Ferro in 1946. He was formerly associated with B. F. Drakenfeld and Company, and during World War II was a lieutenant colonel in the U. S. Army Chemical Corps. Prior to assuming his present post he served as assistant director of research to which he was appointed in 1951.

Two other staff changes were also announced by Ferro. They are the appointment of *E. E. Bryant* as technical director of the porcelain enamel division, and the appointment of *Grant E. Miller*, formerly of Ferro's sales department to the post of director of enamel development replacing Mr. Bryant.

Mr. Bryant joined Ferro in 1936, after erving for a number of years with

the Lisk Manufacturing Company. He is a graduate in ceramic engineering from Alfred University. Mr. Miller joined Ferro in 1944 and left shortly afterwards to serve with the U. S. Navy, returning after his separation from service in 1946. A graduate in ceramic engineering from Ohio State University, he worked at the Ferro development laboratory, was made laboratory supervisor in 1950 and transferred to the corporation's sales and service department in 1951.

#### Kessler Named President of Tuthill Pump Co.

*Harry T. Kessler* has been made president and treasurer of the *Tuthill Pump Company*, Chicago, according to an announcement by *G. B. Tuthill*, former president and now chairman



Harry T. Kessler

of the board. *N. G. Tuthill* was elected vice-president and secretary.

Mr. Kessler has served as executive vice-president of the company since 1943. In his new position, he will direct an extensive expansion program which will introduce several new products into the Tuthill line. Among these are the new Vibro pumps for washing machines and machine tools and an advanced type oil burner pump.

#### Gerity-Michigan Corp. Elections

The election of two new directors and a new secretary of *Gerity-Michigan Corp.*, Adrian, Mich., a leading electroplating company and producer of magnesium castings and other defense items, was announced by *James Gerity, Jr.*, president.

*Robert T. Dunlap*, president of *Great American Industries, Inc.*, Meriden, Conn., and *Hal A. Kroeger*, a founder of *A. & H. Kroeger Organiza-*



Hal A. Kroeger





J. Cary Thompson, Jr.

tion, New York City management consulting firm, were elected directors to fill vacancies on the board. J. Cary Thompson, Jr., a director and heretofore assistant secretary, was elected secretary. He succeeds John F. Langs, who will continue as the corporation's general counsel and a director.

#### Rubber Products Corp. Appoints Harkins

Rubber Products Corp., Division of Automotive Rubber Co., Inc. of Detroit has announced the enlarging of their planning department and the appointment of E. Gerald Harkins as its head.

Harkins, a native Detroit, is a public relations graduate from The University of Detroit and served in the United States Navy.

The growth of the company, a manufacturer of rubber insulated production parts has indicated a more complete production and delivery control



E. Gerald Harkins

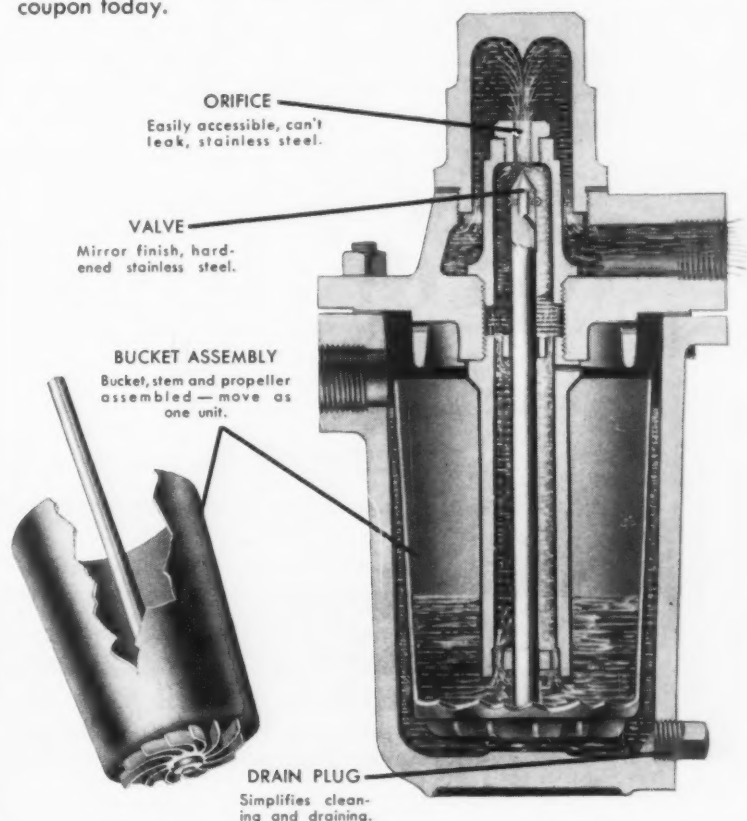
## KEEP UPKEEP DOWN

## no wire drawing with a TRERICE trap!

Wire drawing—a bugaboo for most traps—has been practically eliminated by the rotating valve feature of a Trerice trap. Bucket, valve

stem and propeller—assembled as one unit—comprise the only moving part. Water action rotates the propeller causing the valve to seat differently in the orifice at each discharge. As a result, there's even wear all way 'round. Remember, too, you can completely inspect or service the valve and seat in a Trerice trap in a matter of minutes—without removing it from the line or disturbing high pressure bolts.

But—see for yourself! We'll be glad to provide a 60-day trial installation under your own conditions and without obligation. Send coupon today.



Yes, I want to try the Trerice "Rotating Valve" trap for 60 days.

Trap Size \_\_\_\_\_ Pressure \_\_\_\_\_

Capacity Requirements \_\_\_\_\_

Application \_\_\_\_\_

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

3

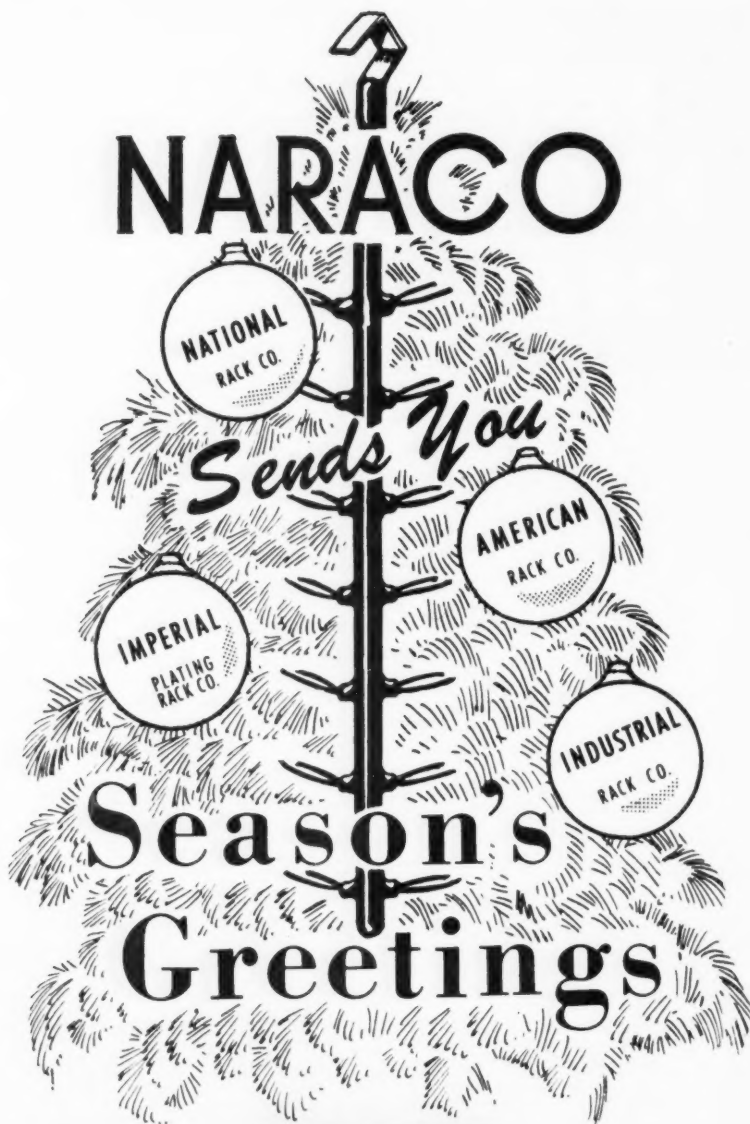
60-DAY  
TRIAL  
OFFER

**H. O. TRERICE CO.**

Manufacturers of Temperature Instruments  
Since 1923

1420 W. LAFAYETTE BLVD.  
DETROIT 16, MICHIGAN

BRANCHES IN PRINCIPAL CITIES



which has been set up and is being directed by Mr. Harkins.

#### INCO Appointments

R. L. Lloyd has been appointed general manager of advertising and R. A. Wheeler assistant general manager of advertising of *The International Nickel Co., Inc.*, it was announced by W. C. Kerrigan, vice-president and general sales manager.

In consolidating into one department the advertising sections of the

Nickel Sales and Inco Nickel Alloys Departments under Messrs. Lloyd and Wheeler, the following other appointments were made: M. J. Phillips, assistant to the general manager of advertising and H. S. Lewis and A. P. More assistant managers of advertising.

#### S. A. Williams Co. To Distribute Ucilon Protective Coatings

The S. A. Williams Co. of 1012 West Lexington Street, Baltimore, has

recently undertaken distribution of Ucilon protective coatings in the Baltimore, Washington, Norfolk, and Richmond areas. This line of maintenance coatings, manufactured by *United Chromium, Inc.*, includes coatings based on vinyls, phenolics, chlorinated rubber, or fish oils. Extensively used for industrial corrosion control, Ucilon protective coatings are resistant to acids, alkalies, salts, oxidants, oils, gasoline, organic chemicals, and a wide variety of other corrosive materials.

Mr. S. A. Williams, founder of the company, has been an industrial corrosion consultant for 25 years. An active member of the *National Association of Corrosion Engineers*, he is a member of that association's Subcommittee TP-6G on Surface Preparation for Organic Coatings.

#### New Domestic Production of Copper Cyanide Announced by Kaynide Div. of Kraft Chemical

The likelihood of any more acute shortages of copper cyanide such as recently faced the finishing industry should be greatly diminished in the future, according to an announcement by Gerald G. Kraft, general manager of the Kaynide Division of Kraft Chemical Co., Inc., Chicago. The announcement states that shipments of copper cyanide can now be regularly made from an entirely new source of domestic production.

The producing company is *Copper Pigment & Chemical Corp.* Special control methods in their modern plant at East Newark, N. J., according to Mr. Kraft, enables them to produce free flowing copper cyanide of exceptionally uniform quality, whiter in color than has usually been supplied in the past.

The entire amount of this new production will be sold through Kaynide Division under its Kaynide label. Immediate shipments can be made not only from the East Newark plant, but also from ample stocks carried in Kaynide's Chicago warehouse. A distributor system is also being set up at key points around the country.

#### Artisan Co. Expands

The *Artisan Company* announces the expansion of its facilities for the design and manufacture of Artisan plating and anodizing racks. Additional manufacturing space has been acquired at their present address — 97 Crosby St., New York 12, New York — according to Mr. H. D. Elbaum, President.

## News from California

By Fred A. Herr



Jack Raskin, who headed the plating supply division of the L. H. Butcher Co., Los Angeles, at the time of the firm's recent acquisition by The Udylyte Corp. of Detroit, has been named manager of the Metal Finishing Division for the eleven western states area, in charge of all phases of operation, including laboratory, technical service, sales and production in the Los Angeles, San Francisco, Oakland, Portland, Seattle and Salt Lake Districts.



Earl W. Arnold

Earl W. Arnold, a L.H.B. technical service engineer for the past six years, has been promoted to assistant manager of the Metal Finishing Division. Norman Dieball, formerly with Udylyte's Detroit organization, has been appointed supervisor of L.H.B. west coast manufacturing facilities, with headquarters in Los Angeles. William Lidke, formerly a chemical engineer at the Detroit main plant, has been named to the L. H. Butcher Company technical service staff, attached to the laboratory department at Los Angeles.

Other additions to the company's West Coast metal finishing department staff announced by Raskin are:

David Althouse, formerly head of

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Motor Products Corporation  
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and many other outstanding  
metal working industries.



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## N. RANSOHOFF, inc.

EQUIPMENT FOR THE SURFACE TREATMENT OF METAL

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Cincinnati 16, Ohio

the Metal Finishing order department in Los Angeles, has been promoted to sales engineer. Warren Blazer succeeded Althouse as order department chief.

Richard Cohen, graduate chemical engineer, is now in charge of manufacturing department in San Francisco. Floyd Browning, formerly plating department manager for the Schlage Lock Company in San Francisco, has been appointed to the L.H.B. sales engineering staff in the San Francisco district. Kenneth Humphries has been added to the sales staff in the Portland, Ore., area, and Frank Burns in a similar capacity at Spokane, Wash.

Metallizing Engineering Co., Inc., formerly at 520 North Western Ave., Los Angeles, has moved to new quar-

ters at 1206 Maple St., same city, where larger facilities are available for the manufacture of metallizing equipment.

San Francisco Branch of the American Electroplaters Society has launched a drive to increase membership, which for the past year has fluctuated between 60 and 70. The goal is 100. The branch also is striving to stimulate meeting attendance by instrumentating a plan suggested by C. R. Owens of the Board of Managers. This calls for each member of the membership committee to phone ten members before each meeting and urge them to attend. J. R. Pattenger heads this branch as president, and Horace J. Smith is secretary-treasurer.



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Preconceived notions that cadmium plating just naturally offers better protection than zinc are contrary to the true facts. Simply because cadmium is freer again is no reason for re-converting to it. Cadmium is still and always will be far more costly than zinc. When the zinc is passivated in Luster-on conversion treatment it is far superior to cadmium for all but extremely specific applications. These are basically (1) a marine atmosphere and (2) a bearing surface.

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**THE Chemical CORPORATION**  
58 Waltham Ave., Springfield 9, Mass.

Oakite Products, Inc., New York, conducted a technical educational conference at the Hollywood Roosevelt Hotel, Los Angeles, November 10, 11 and 12th, for technical indoctrination of sales representatives of the firm's northern and southern Pacific divisions. Some 90 Oakite representatives attended.

Out from New York headquarters for the conference were John Carter, Oakite, president; H. L. Gray, vice-president in charge of technical operations; E. Lingle, director of sales development; Frank Oldroyd, national sales manager; Dr. Clarence Brenner, assistant chief chemist; and Gerald A. Lux, technical educational director. Mr. Lux reported a highly successful conference was held. The next educational conference is scheduled for St. Louis, Mo., for the company's representatives from Chicago, south.

Glenn Beckwith, vice-president and general manager of Metallon Corporation, Los Angeles, fabricators and finishers of tubular products and flanges for the plumbing industry, reports that his firm has just completed constructing and equipping a new \$80,000 plant at Canfield, Ohio, of 15,000 square feet floor area. The new factory will service the company's customers in the mid-west and on the Atlantic Coast, while the Los Angeles plant will continue to serve the area from the Mississippi west.

George Mitchell, director of laboratory and process control of the Stand-

ard-Thompson Corp., Dayton, Ohio, spent several weeks in Southern California in October and November making a study of processes and production techniques in use at the plant of the Centrifugal Investment Casting Co. in Burbank, Calif., a new subsidiary of the Ohio firm. Mr. Mitchell attended the November 12th meeting of Los Angeles A.E.S. Branch as guest of Emmet Holman, chief chemist for Turco Products, Inc., Los Angeles.

Jack Bealle, president of Crown Chemical & Engineering Co., Los Angeles, returned November 17th from a month's business trip to the mid-west, southwest and Atlantic seaboard. Principal purpose of the trip was to contact the firm's present representatives and to set up new distributorships for Inet rectifiers and transformers for which Crown Chemical serves as national distributor. He visited Chicago, Detroit, Springfield, Mass., Buffalo and Olean, N. Y., and Dallas and San Antonio, Tex.

When Gerald A. Lux of New York, technical educational director of Oakite Products, was in Los Angeles in mid-November, he requested us to "... mention something in your column about Newark A.E.S. Branch's forthcoming educational session."

Newark Branch of the A.E.S. will hold its annual educational session on December 12, and Christmas Party and Banquet on December 13, both at the Robert Treat Hotel.

There you are, Jerry. Hope Newark draws a big crowd to both affairs.

use

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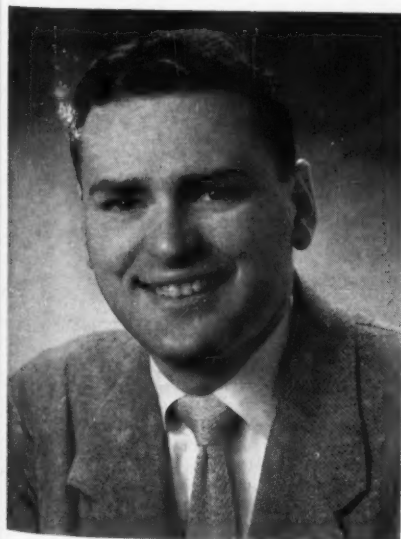
**BAKER DISTRIBUTING COMPANY**  
1105 W. 11th St., Cleveland 13, Ohio

The Columbia Division of U. S. Steel, San Francisco, recently completed a 11-day "school" which afforded educators representing eleven Western colleges and universities an opportunity for first-hand study of modern steel making production and finishing methods. The group spent 11 days in the company's plants at Pittsburgh, Calif., Geneva, Utah, and other sections. The educators were given on-the-spot lectures and demonstrations in the mechanics of steel making in the steel mill, sheet and tin plate mill, and were shown the processes and techniques involved in hot dipping of tin plate and other operations.

In attendance were educators representing the College of the Pacific, Pomona College, San Francisco City College and the universities of California, Southern California, UCLA, Stanford, Oregon, Utah, Colorado, and Washington.

One workman was killed and eight others sustained serious burns as the result of a white-hot explosion of metallic magnesium dust in the plant of the H&S Tool Products Co., Los Angeles, on November 7th. Warren Smith, co-owner, disclosed that the explosion resulted when sparks from a grinding wheel ignited magnesium shavings on the floor.

#### L. H. Butcher Co. Announces Technical Service on Enthone



Bert J. Sherwood

In support of its recent establishment as the exclusive West Coast distributor

and manufacturer for Enthone, Inc., L. H. Butcher Co., subsidiary of the Udylyte Corp., Los Angeles, has appointed Bert J. Sherwood to the position of technical representative, specializing in Enthone products. Mr. Sherwood will be responsible for laboratory development and processing in addition to providing assistance in the field to the sales staff on technical problems relating to Enthone finishing processes.

In his previous position as leading engineer in charge of the metal finishing unit of the Materials Research and Process Development Group at North American Aviation in Downey, Calif., Mr. Sherwood supervised a group of chemical technicians and engineers engaged in research, development, pilot

# clean as a whistle



*Smooth—Stain-free—Spotless!* There's nothing like a dip to brighten and improve the appearance. This applies not only to a four-year-old but also to metal. For junior it's soap—for metal it's Mutual's Chromium Chemicals.

Leading brass manufacturers find a Sodium Bichromate dip, with sulfuric acid, to be the most effective treatment for removing stains resulting from annealing. A metal surface uniformly clean, bright and pleasing in appearance emerges from this bath.

Many other metal treatments employ Bichromate. Used on aluminum and magnesium it contributes to the development of corrosion-resistant films. Mixtures including Bichromate or Chromic Acid are used to form protective and paint-base coatings on iron, steel, zinc, cadmium, aluminum and magnesium.

Mutual's Research and Development Department has a wealth of technical data on the use of Chromium Chemicals in metal treatment. Inquiries are welcome.



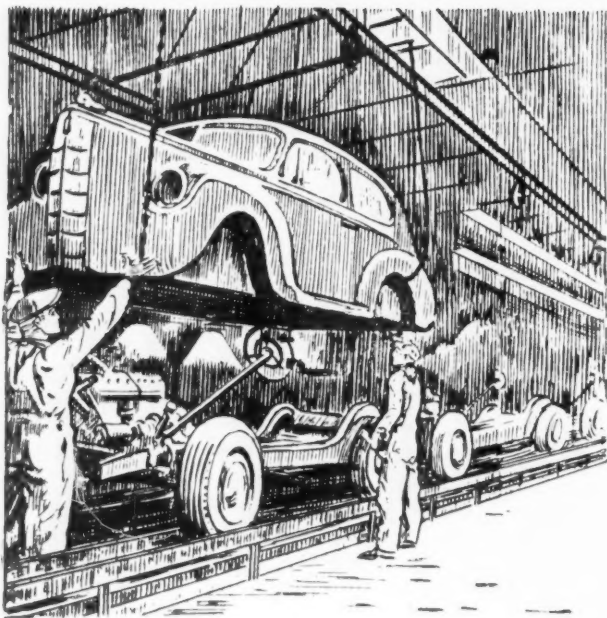
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plant evaluation, and consultations on the metal finishing problems relating to guided missile and electromechanical component fabrication.

After graduating from Virginia Tech with honors and receiving a Bachelor of Science degree in Chemical Engineering, Mr. Sherwood went on to the University of Southern California to earn a Master of Science degree in Chemical Engineering. While at U.S.C. Mr. Sherwood was the recipient of an industrial research fellowship from a nationally known chemical company.

Although his headquarters will be at the Los Angeles office, Mr. Sherwood will be available to the metal finishing industry in the eleven Western states served by the other L. H. Butcher offices.



# MOTOR CITY PLATING NEWS



by

*Edward Finney*

L. D. Cook of the Wyandotte Chemicals Corp. has been elected chairman of the Detroit section of The National Association of Corrosion Engineers.

Also elected were these new officers:  
Vice-president — W. H. Cavanagh, Parker Rust Proof Company.

Treasurer—P. G. Coates, Michigan Bell Telephone Company.

Secretary—D. F. Finlay, Hinchman Corp.

\*\*\*\*\*

Ronald J. Reagh has been appointed sales representative for Northeastern

Michigan for the Rinshed-Mason Co. Reagh formerly held the position of director of industrial relations.

Cyril J. Riedy, recently assistant director of the department of co-ordination of the University of Detroit, assumes Reagh's former post.



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COMPANY  
LETTERHEAD



Election of two directors and a new secretary of the *Gerity-Michigan Corp.* were announced by *James Gerity, Jr.*, president.

*Robert T. Dunlap*, president of *The Great American Industries, Inc.* of Meriden, Conn. and *Hal A. Kroeger* of a New York management consulting firm were named to vacancies on the board.

*J. Cary Thompson, Jr.*, a director and formerly assistant secretary, was elected secretary. He succeeds *John F. Langs*, who will continue as general counsel and a director.

\*\*\*\*\*

The *Newcomb-Detroit Co.* announced its acquisition of *Windsor Metal Fabricators, Inc.* of Windsor, Canada.

The new subsidiary will be known as *Newcomb Industries, Inc.* with *David H. Baird*, a sales executive in the *Newcomb-Detroit Co.*, becoming vice-president in charge of sales of the subsidiary.

*Clinton W. Vickerman*, formerly manager of the old firm, will become plant superintendent.

\*\*\*\*\*

The *Michigan Alkali Division* of the *Wyandotte Chemicals Corp.* has promoted *C. F. Sanborn* to manager of

sales research and control; *F. M. Zorn* to manager of the order and scheduling department; and *M. D. Thompson* to assistant director of traffic.

Sanborn's new department includes the former market research and sales control departments.

\*\*\*\*\*

*James Malone* has joined the sales staff of the *Michigan Chrome & Chemical Co.* of Detroit, working for *Russell Axsom*, sales manager.

Jim has long been active in Detroit plating circles having spent many years with *United Platers* in a sales capacity. He has held office in the Detroit branch of the A.E.S.

Jim is one of the nicer fellows in plating and our good wishes go with him in his new job.

\*\*\*\*\*

*Howard Plating Industries*, 319 E. Ten Mile Road, Royal Oak, Mich. has formulated and is offering its phosphate coatings to the metal finishing industry. Coatings for rust proofing, paint bond and drawing are available according to *Walter A. Osip*, technical director of the newly formed phosphate division of the company.

Mr. Osip brings to *Howard Plating* a wealth of experience in the phosphate

coating field gained in several years spent with the *Tanner Chemical Co.* and *Detrex*.

\*\*\*\*\*

The November meeting of the Detroit branch of the A.E.S. was held on Friday, the 7th at the Statler Hotel.

*Walter Pinner*, manager of process development at the *Houdaille-Hershey Corp.*, spoke on "Problems for the Future" and, as the title indicates, talked on our problems as they are related to polishing, buffing, bright nickel and corrosion testing. Certainly the talk was interesting and informative as only Walter can make it.

A motion picture was shown and refreshments served after the meeting.

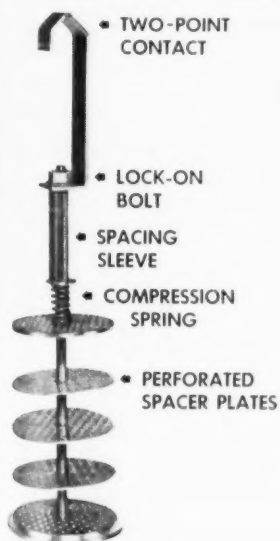
## Associations and Societies

### Dr. Blum Honored at Electrochemical Meeting in Montreal

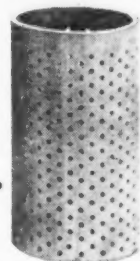
*George B. Hogaboom*, co-author of the book "Principles of Electroplating" introduced *Dr. William Blum* at the luncheon of the American Electrochemical Society in Montreal at which *Dr. Blum* was presented with Honor-

## Save Sorting Time After ANODIZING

If you want speed in your finishing department use these durable Nankervis anodizing baskets. You'll be able to process different parts at the same time; perforated spacer plates keep each batch separate, eliminating time-consuming sorting after anodizing. And Nankervis baskets last longer, cost less to buy! Write for Bulletin B-2.



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Dr. William Blum

ary Membership in the Society. Mr. Hogaboom outlined Dr. Blum's contributions to the Society and to the industry in general, emphasizing the fact that he has been a great inspiration to others to work in this field.

Mr. Hogaboom and Dr. Blum met in Atlantic City in 1912 and have worked together in the field of electrodeposition since that time. Dr. Blum became a member of *The Electrochemical Society* in 1914, was made Secre-

tary of the Electrodeposition Division in 1922 and became President of the Society in 1926. In 1944 he won the Acheson Medal. Dr. Blum has written 12 papers for the Society and has been the co-author of 12 others. He has taken part in 163 recorded discussions on papers presented and in countless other discussions which are not recorded. During these discussions he was noted for his cooperation and patience.


At the present time Dr. Blum is retired from active work as Chairman of the Electrodeposition Division of the Bureau of Standards. After his retirement, 100 of his papers were leather bound and presented to him by the Society. He has also been active for many years in the work of the American Electroplaters Society where he is noted for his exposure tests on protective coatings, for writing the first specifications for plating, for his contributions on the spotting out problem and his research on the physical properties of nickel deposits. In recent years Dr. Blum was assisted in this activity by *Dr. Abner Brenner*.

A group of scientists who were



George B. Hogaboom

formerly employed at the Bureau of Standards under Dr. Blum and now refer to themselves as the N.B.S. Alumni are still active in the plating industry. Among those listed by Mr. Hogaboom are: *Thomas F. Slattery*, Assistant Director of the Bureau of Printing and Engraving; *H. D. Holler*, Corrosion Research, Naval Research Laboratory, Washington, D. C.; *R. M. Wick*, Electrodeposition Research, Bethlehem Steel Company; *R. O. Hull*,



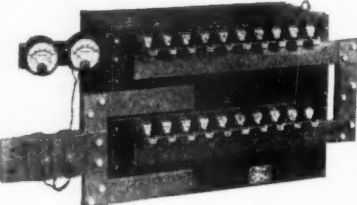
## MOTOR GENERATORS

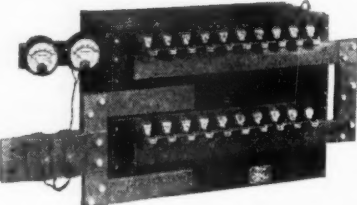
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inventor of the Hull Cell and head of his own firm in Cleveland, Ohio; *R. A. Dimon*, Electrodeposition Research, Carnegie-Illinois Steel Co.; *H. L. Farber*, Electroplating, Westinghouse Electric Mfg. Co., Mansfield, Ohio; *G. A. Lux*, Oakite Products Co.; *W. P. Barrows*, Electroplating Research, Specifications, U. S. Navy Yard, Washington, D. C.; *C. T. Thomas*, Chief, Electrodeposition Division, Bureau of Printing and Engraving; *W. A. Olson*, Assistant Chief of the Bureau of Printing and Engraving; *H. E. Haring*, Bell Laboratory, developer of the Haring cell; *W. E. Bailey*, Chemical Division of the N.P.A.; *Charles W. Jennings*, Professor of Chemistry at the University of North Carolina, Raleigh, N. C.

Among the honors which have been conferred on Dr. Blum are: the medal from the Institute of Chemists, 1926; the Acheson Medal in 1944; Department of Commerce Medal in 1951; Award of Merit of the A.S.T.M. in 1951; a Special Award from the Frankford Arsenal in 1951 and Honorary membership in the A.E.S. in 1952.

Dr. Blum's next project is a trip to Australia in the near future during which he will lecture to the branches of the Electroplaters Society located there.

### CHICAGO ELECTRO-PLATERS INSTITUTE

The Chicago Electro-Platers Insti-

tute on October 16th, presented a total of \$1,600 in rewards to four Chicago police detectives for their activity in apprehending and convicting the burglar who was responsible for many thefts of critical metals from Chicago electroplating shops.

The reward was initiated at a mass



Carl F. Hansen, Chairman of the Chicago Electro-Platers Institute presents checks totalling \$1,600 to Chicago detectives as a reward for their efforts in arresting and convicting the burglar responsible for many thefts of allocated metals from Chicago plating shops. Shown in the group (l. to r.) are detectives George Haennicke and Al Dean, Hansen, detective Peter Nutley and Austin E. Torney, Institute Legal Counsel. Not present, but also rewarded was detective John Weston.

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meeting of Chicago electroplating shop owners and managers on August 21st, 1951, as the result of a series of 30 burglaries of scarce metals, primarily nickel. This metal, valued at about \$50,000 at legal prices would have brought a quarter of a million dollars at "gray market" prices, at that time.

Following several conferences with Chicago Police Commissioner O'Connor, a reward of up to \$2,500 was announced and police were alerted to watch plating establishments in their districts. Posters announcing the reward were placed in and around plating shops throughout the city.

On October 4, 1951, a thief was apprehended in the plant of the *Triner Scale Co.* In the following months, the four detectives spent many hours of their own time in gathering evidence for the case. The thief confessed to the *Triner Scale Co.* burglary and to thefts from seven other metal firms. He was tried and convicted of three of the burglaries on August 8th, 1952, and is now serving concurrent two-to-three year sentences for each of the three thefts.

Although no metal thefts have been

reported in recent months, the Chicago Electro-Platers Institute has extended the \$2,500 reward offer to August 31, 1953.

## AMERICAN ELECTROPLATERS' SOCIETY



### Detroit Branch Honors Phillips

On Friday, October 3rd, over 225 members and guests of the *Detroit Branch, American Electroplaters' Society*, paid tribute to *William M. (Bill) Phillips*, Research Consultant, General Motors Research Laboratories, for his 40 years of service to the electroplating industry. Mr. Phillips was made a member of the "*Order Of The Pot*," a group consisting of past National Presidents of the Society and also was presented with a 21-inch television set donated by members of the branch.

*Frank Clifton*, who has been a co-worker with Phillips for many years at the General Motors Corporation Research Laboratories, brought to light

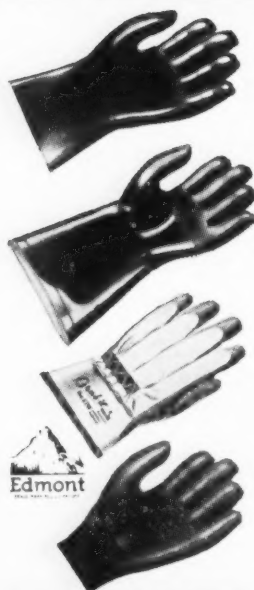
some of Phillips background and accomplishments during his many years in the industry.

Clifton said that "*Bill*" Phillips attained his B.S. degree from the University of Pennsylvania. After graduating he was employed for 8 years at the Inland Manufacturing Company where he eventually became General Manager.

In 1921, Phillips joined the General Motors Corporation and has remained there ever since. He has served as Advisor on Electroplating, Painting, and Enameling and also was Head of the Electrochemistry Department at General Motors Research Laboratories for many years. At present in addition to being Research Consultant for the General Motors Corporation, he is connected with the National Production Authority serving on committees studying controls on metals used in electroplating. Almost half his time is spent with the N.P.A. in Washington.

Clifton said further that Phillips is a past National President of the American Electroplaters' Society and also is a member of many other technical organizations including the American Society for Testing Materials, Society

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**White Fabric Lined Grab-it Gloves:** Rough finished, sure gripping, long wearing natural rubber coating over all-white fabric liners.

**3 New Hand-Fitting Plastic Gloves:** "Grappler" (feels like leather, but wears far longer); "Monkey Grip" improved brown plastic; "Sani-Gluv" white plastic for sanitation. All have wing thumb, pre-flexed fingers, perfect hand fit.

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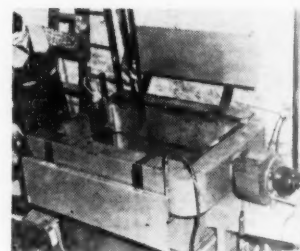
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of Automotive Engineers, Engineering Society of Detroit, Society of the Plastics Industry, American Ordnance Society, Society of Plastics Engineers, and American Society for the Advancement of Science. He has obtained patents on electroplating and rubber application processes and also has written many technical articles. Clifton described Phillips as "a true dean of electroplating who has contributed more than his share to the industry."

Walter Pinner of the Houdaille-Hershey Corporation brought to light a number of Phillips' other activities including hobbies and interesting anecdotes about Phillips' public life in the plating industry.

"Bill" Phillips himself addressed the branch discussing *Metal Shortages Viewed from Washington*. He predicted that controls on metal, particularly nickel will be eased considerably in the second quarter of 1953. He said that improved manufacturing methods in the jet engine manufacturing program should result in a considerable saving of high nickel alloys. Also, nickel production itself is to be substantially stepped up in 1953. About 20 million pounds per year more are to be produced than at present. Seventy



Left to right: H. E. Head, President Detroit Branch; Bill Phillips; Fred Wagner, Educational Chairman Detroit Branch; F. L. Clifton and Walter Pinner.

per cent of the total world nickel supply is now being used by the United States.

The Atomic Energy program requires about 5 to 7% of the United States consumption but Phillips expressed the opinion that once Atomic

Energy equipment is constructed, no vast quantities of nickel would be required. This also would help release nickel for electroplating uses.

The National Production Authority considers electroplating important to the economy of the United States and

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acknowledges that brightly plated parts are essential to sell automobiles to the American public. The automotive industry is said to represent one-eighth of this country's economy.

Phillips said that eventually all controls on metals would be revoked as the military program becomes stabilized. The NPA is making good progress toward getting enough nickel to plate all civilian goods without interfering with a reasonable military program.

### Louisville Branch

The regular monthly meeting of the *Louisville Branch, American Electroplaters' Society* was held Thursday, October 16, 1952 at Korfhage's Restaurant, 1482 Preston St., Louisville, with a dinner served at 6:30 P.M. President *Arthur A. Oertel* opened the business and open meeting at 8:00 P.M. with twenty-six members and guests present.

The roll call of officers was read and Board of Managers member *Garland Logsdon* was reported absent. The minutes of the previous meeting was read and accepted.

The Technical Sessions Chairman, *Stanley J. Beyer*, reported that *R. W. Couch*, of *United Chromium, Inc.*, will be the November speaker on the sub-

ject of Conversion Coatings of Zinc and Cadmium.

It was nice to see *Gerhard Hillebrand* at the meeting. We hope he will continue to come. *Tom Allison* introduced the following guests: *James Grote* and *Harry Wuebold* of the *Globe Chemical Co.* and *Tom Walsh* of the *American Standard and Sanitary Co.*

The Amendment to the Constitution and By Laws to increase the dues \$1.00 per year for the research fund was brought up for discussion. Comments were expressed by *Hillebrand* and *Beyer* which was turned into a motion in favor of the amendment and unanimously passed by the Branch. The delegates were instructed to vote in favor of the amendment.

President *Arthur A. Oertel* has suggested that we have our dinner meetings at 7:00 P.M. instead of 6:30 P.M. to give a person more time for preparation. He then turned the meeting over to Technical Sessions Chairman, *S. J. Beyer*, who, after a brief talk, introduced the speaker of the evening, *H. W. Kennedy* of the *E. I. Du Pont De Nemours Co.*, *Wilmington, Del.* At this point refreshments were ordered — courtesy *Al Steidle* of the *Steidle Chemical Co.*, *Louisville*.

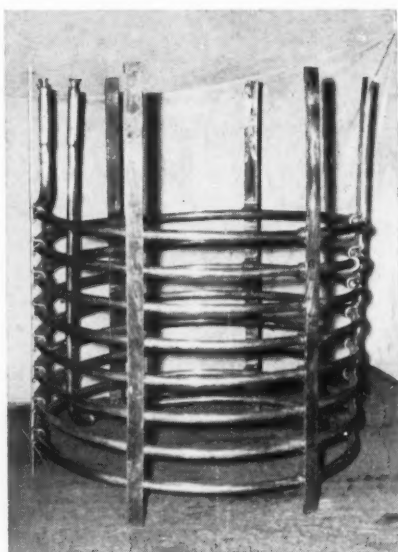
*Mr. Kennedy* spoke briefly and stated that a picture would be shown entitled "The Du Pont Story." This picture presented the starting of the Du Pont company in 1802 with the outstanding discoveries of many materials and the tremendous growth of the company to the present day, employing thousands of chemists and engineers in their vast research laboratories. The film was fairly long, but very interesting and educational and was immensely enjoyed by all present. After the picture, *Mr. Kennedy* spoke on the subject, "Effects of Impurities in Cyanide Plating Solutions" which can be summarized as follows:

1. Impurities such as lead, iron and chromium are tough to control, detrimental to bright deposits and will cause streaky, brittle and blistered deposits. It is important to keep impurities out of the plating solution — organic impurities will also cause trouble.

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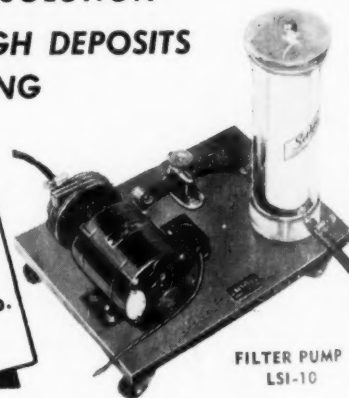
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to proper relation including the pH which is also important.

Considerable discussion followed and Mr. Kennedy was given a rising vote of thanks for a very interesting talk and picture.

Refreshments were then served by courtesy of the du Pont Co. and the meeting was adjourned at 10:30 P.M.

#### Indianapolis Branch

The November 5th meeting of the *Indianapolis Branch* was held at Fox Steak House with twenty-seven present for dinner and twelve additional persons present for the meeting and program. Since president, *Don Patrick*, was in Washington, D. C., vice-president, *Al Kriese* presided. The meeting opened with introductions of all persons present. The secretary's minutes were read and accepted.

Under old business a report was given to the membership about the bank balance in the checking account. It was suggested it be left for further accumulation for a national convention in the future.

*Robert Ruloff* of the Dayton Branch was present and extended an invitation to their education session and dinner

dance on April 18th, 1953 at the Biltmore Hotel.

*Herb Kennedy*, a member of our branch but a resident of Cincinnati, announced the Cincinnati Branch education session and dinner dance which will be March 28, 1953 at the Sheraton-Gibson Hotel.

At 8:30 P.M. the program began which was a round table discussion of "Generators vs. Rectifiers" with *Ed Bruck* as moderator. This proved to be a worthwhile topic and much discussion took place by all present. The two types of equipment were compared as to their cost, operating efficiency, power factors, flexibility, over-load and endurance. Three charts were presented by Mr. Bruck which helped the group see the comparisons. Refreshments were served along with the program. The meeting adjourned at 9:55 P.M.

#### Twin City Branch

The *Twin City Branch* of the *American Electroplaters' Society* met on Monday, November 3rd, 1952 at 6:15 P.M. at the Pine Tavern in Minneapolis with 31 persons present.

Branch president, *Jerome M. Weller* of *Minneapolis Honeywell Regulator*

*Co.* called the meeting to order following dinner at 7:00 P.M. and introduced the following guests: *Bob Peterson, Sr.* of *Twin City Chromium Plating Co.*, Minneapolis, Minn., *Jack Winters* of *R. O. Hull Co.*, Cleveland, O., and *Clifford P. Barth* of *Merchants Chemical Co.*, who is transferring from the Cincinnati Branch to the Twin City Branch.

Branch librarian, *Fred Kaim*, of *Superior Plating & Rustproofing Co.* gave a short talk on the coming meetings of the year.

Following the business session the program was turned over to *Fred Kaim* who introduced the speaker for the evening, *Jack L. Winters* who spoke on "The Hull Cell." Mr. Winters' talk together with the presentation of slides on this subject was of considerable interest for all present and he was given a rising vote of thanks upon completion of his talk.

#### Newark Branch

Newark Branch will hold their annual Educational Session on Friday evening, December 12th, 8 p.m. at the Hotel Robert Treat. Newark, N. J. Speakers:



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R. B. Saltonstall, Technical Director of Udylyte Corp. "White Brass Plating."

Their annual banquet also at The Robert Treat will be held on Saturday evening, December 13th, 7 p.m.

#### New York Branch

The meeting was called to order by A. Amatore, president, on Friday, October 10, 1952, at the Hotel Statler, N. Y.

Applications for membership were received from B. Delovelock and C. Lambert. The following were accepted for membership, and duly installed: U. Gotlieb, S. Ratoff, L. Neiheim.

The following transfers were read, and accepted by this branch: Fred Nadel (Newark); Wm. Lalstein (Newark); Kenneth Green (Cleveland).

Mr. Schore announced that Stanley Goodis had passed away, and a motion was made by G. Herrmann that a page be set aside in the Annual New York Branch Book in his memory. G. Schore gave a final, and complete, report on the National Convention that was held in Chicago in June, 1952.

A communication received from D. Gardner Foulke, executive secretary, was read by Mr. Schore, on the Amendment to the Constitution and By-Laws, to increase the minimum dues and Per Capita Tax, for the support of research.

G. Herrmann made a motion, and it was seconded by G. Schore, that the New York Branch pay \$1.00 per member, per annum, for the research program. The motion was presented to the Branch, and it was duly accepted, as read, Mr. Nadel withdrew his past motion, which was to donate \$100.00 to the National Society, for the research fund. There being no other business, the meeting was turned over to the librarian, P. Veit, who presented a motion picture on Barrel Plating, by Frederick B. Stevens, Inc.

#### Chicago Branch

The October 10 meeting of Chicago Branch attracted 85 members to hear Richard Atwood of the Bersworth Chemical Co. read an informative paper on the "Versenes" and their applications in electroplating. Mr. Atwood described the purposes of this new chemical product and explained

its chelating effects in controlling metallic contaminations ordinarily present in plating and pickling baths.

The ability of the "Versenes" to selectively complex metallic ions can be utilized in preparing electroplating baths. This unique chemical performance was amply illustrated with slides and graphs together with various case histories on widely used plating baths.

An interesting question period that lasted for almost an hour gave evidence of the tremendous possibilities which Mr. Atwood's presentation initiated among Chicago platers.

President Ray Ledford introduced the following new members to the Chicago Branch: Bob Stewart and Charles Breckenridge of The Sarco Co., Alger non Parker of Dearborn Chemical Co., Wayne Armstrong of Danville Plating Works, James Cooper of Frederic B. Stevens Co., Dan Trapp of Durebilt Mfg. Co., Archie Simmons of Craftsman Plating Co., Braley Meyers of International Harvester Co., Robert and John Stoneking of Victor Casket Hardware Co., Russ Miller of Stewart-Warner Corp., Robert Rohr of Mitchell Bradford Chemical

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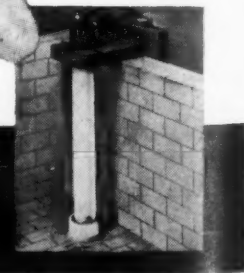
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Chairman Ewell McCoy of the Research Finance committee announced the subscription of *AAA Plating Co.*, Chicago, as the newest sustaining member. Paul Glab explained the membership survey he is conducting to find out which night is preferred for business meetings of the branch.

**"They Were There" Dept.:** Leonard Pravel describing trials and tribulations of operating his business. . . . Lenny has formed his own company called *Len-Pravel Inc.*, specializing in buffing and polishing equipment. . . . Jimmy Vallone after 18 years with *Croname*, has cast his lot with the *Frederic Gumm Chemical Co.* as a field engineer for Clepo cleaners. . . . We note the growing tendency of solid company representation as witnessed by the following groups: *O. J. Smith*, *A. R. Klomp* and *Neil Fitzsimmons* of the *Sunbeam Corp.*, *J. C. Bramson*, *R. McCormick*, *E. N. Babcock* and *H. Huizinga* of *Ford Aircraft Division*, *Bill Strelow*, *Frank Martinek* and *Jack Curry* of *Hotpoint*, *John Galenti* and *Al Leonardo* of *Driscoll and Co.*, *Harry Stopek* and *Jerry Kraft* of *Kraft Chemical Co.* . . . *Klem Pe-*

*trosios* can't leave Chicago and we're happy about that . . . still makes the trek from Kenosha where *Nash-Kelvinator* keeps him busy. . . . *Floyd Mickelson* of *Motorola* earning his spurs in the Chicago activity. . . . *Dallas Armstrong* and *Gene Gryglas* discussing their problems. . . . And how about *Bill Varnish* making two meetings in a row! . . . One of the nicest things about Chicago Branch meetings is *Miss Irene Donnelly*. . . . Still hearing compliments on the September meeting. . . . Apparently *Scott Modjeska*, *Russ Harr* and *Bill Hodges* created a stir with their symposium on metal thickness testing. . . . *Larry Clark* and *Owen Towner* recuperating from hospital visits. . . . Get well quick!

*Rudy Hazucha*, Banquet Chairman, announced that plans are well along for Chicago's annual banquet to be held Saturday, January 31, 1953 in the Grand Ballroom of the Conrad Hilton Hotel. An excellent dinner, first line floor show and dancing to Lou Breese and his orchestra will make for a superlative social event. Tickets will be \$10.00 per person.

*Joe Andrus* is planning a varied educational session for the January

annual meeting. The program will embrace three general topics of interest to all platers and will include papers on organic finishing, precious metal plating and electrolytic pickling.

"Bright Copper Plating Today" will be the subject of *Dr. Henry Kellner* at the Nov. 14 meeting. Hank Kellner is a former chairman of the national Research Finance Committee and has many friends in the Chicago Branch. His position as technical director for the *Lea Mfg. Co.* makes it possible for him to bring latest developments in this basic deposition to the attention of the industry.

Chicago Branch meetings are held on the second Friday of each month at 84 E. Randolph St. Cocktails at 6, dinner at 7, educational session at 8. All are invited.

#### Baltimore-Washington Branch

On Tuesday, October 14, 1952, the Baltimore-Washington Branch met at the *Allied Research Corp.*, Baltimore, Md., for the first meeting of the current season.

The speaker of the evening was *Charles Ostrander* of *Allied Research*.

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His subject was "Chromate Conversion Coatings for Decorative and Protective Metal Finishing." This talk was followed by a tour of the Allied Research plant and by the serving of refreshments.

The branch was requested by the Chicago branch to support a society amendment whereby dues would be increased to cover the payment of \$1.00 per member to the A.E.S. Research Fund. Inasmuch as it has long been the practice of the Baltimore-Washington Branch to contribute to the Research Fund, delegates were instructed to support the amendment when it is brought to a vote.

Fielding Ogburn's proposal to alter the manner of accrediting of delegates was discussed. The Branch is now awaiting word from the Executive Board on this matter.

The Statler Hotel was approved for the A.E.S. convention to be held in Washington June 17, 1956. Dr. W. Blum and T. Slattery have accepted the positions of Honorary Co-chairman of the 1956 convention; A. Pierdon, who has acted as Temporary Chairman, was named permanent Chairman of the convention.

The Branch voted to elect to membership Roger B. Langston and to reinstate Richard G. Evirs.

### Pittsburgh Branch

The Pittsburgh Branch of the American Electroplaters' Society held its regular meeting at the Sheraton Hotel on October 9. Officers present were: Art Kaupe, Rex Goldbach, Bob Varner, Rudy Schindler, Damon Antel, Leo Schmitt, Sr., Ed Smith, Bob Woof-ter, Ed Washburn. Twenty-seven members enjoyed a delicious meal prior to the business meeting, and a near record attendance of fifty members and guests took part in the technical session.

President Rex Goldbach, brought the meeting to order and he asked everyone present to stand and introduce themselves, also giving company affiliation.

Glenn Herring reported on the progress of the November Milwaukee Party Night and we all hope that a large percentage of our membership and their guests will be able to attend on Saturday, November 8, at the Fort Pitt Hotel, 7:30 P.M.

Bill Hennessey, now a member of the Philadelphia Branch, was a most welcome guest and gave a report on the work that the Philadelphia National Convention committee has been doing.

Four new members were welcomed into the Branch. They are: Albert Hart, G. K. Garrett Co.; Angelo Certo, Standard Steel Spring Co.; Michael Vucich, Weirton Steel Co.; Robert W. Bishoff, Standard Steel Spring Co.

Ed Smith read a letter from the Chicago Branch requesting support for the proposed change in By-Laws which would increase dues one dollar per member; this additional money would be used for the Research Fund. Sam Johnston made the motion and Leslie Lancy seconded the motion that the delegates be instructed to vote for this proposed change.

Ed Washburn, in the absence of Librarian, G. S. Woodruff, introduced the speaker for the evening, Dr. Walter R. Meyer, Enthone, Inc., New Haven, Conn. The subject on which Dr. Meyer spoke was "Adhesion of Electrodeposits and New Methods of Oxide Removal and Cleaning." The use of slides

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accompanied by a running commentary made the talk interesting both to the technical men and the practical platers present. A lively question period followed the main talk and a standing ovation was given to Dr. Meyer in appreciation of his fine presentation.

#### Cincinnati Branch

The Cincinnati Branch of the American Electroplaters' Society met on October 22, 1952, at the Engineering Society headquarters with a fine turnout, both for dinner and the meeting. Prexy R. D. Miller opened the proceedings by introducing Vance Clark who gave a short talk in support of a school levy to be voted upon at the November election.

Dick Evans then presented a report on an assessment of \$1.00 per member by the Engineering Society for the use of its facilities. In addition, the branch is faced with added costs for the Society's weekly bulletin and annual directory. Mr. Evans therefore suggested that dues be advanced \$1.20 to \$10.00 per annum, effective March 31, 1953. Harold Webb moved to so increase the dues, and Wm. Albohn

seconded the motion which was passed.

Discussion next centered on the Regional Educational Meeting and Dinner Dance. A report was given by Charles Wise on the work of the preliminary committee. He stated that March 28, 1953, had been reserved at the Hotel Gibson, and gave a resume of the costs of such an affair, advising that tickets for the dinner dance would cost \$7.50 per person. Mr. Miller then dissolved the temporary committee, appointing a new one in its place with Charles Wise as general chairman and Martin Gannon, Jr. as co-chairman. Ray Barry was appointed chairman of the educational program, assisted by Stanley Garfinkel and Dick Evans. Charles T. Nuzum, finance chairman and W. B. Stephenson, Jr. banquet chairman assisted by Carl Truman.

Stanley Garfinkel reported on the work of the Engineering Society's Membership Committee. Since they will have to employ a secretary to straighten out their records, he volunteered a contribution of \$3.00 from the Cincinnati Branch.

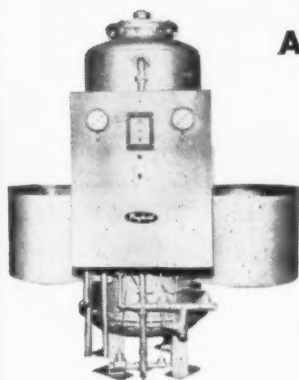
The applications of Don Weaver and W. J. Ryan were presented to the membership, and both applicants were unanimously accepted.

The speaker, Dr. R. B. Saltonstall of the Udylyte Company was next presented. Taking "Nickel Plating Today and Tomorrow" as his subject, the speaker traced the early development of nickel plating and said that such operations started on a commercial basis in the 1870's in the stove and bicycle industries. He stated that the large demand by the military and atomic energy programs for nickel was responsible for the current nickel shortage. The government is also stockpiling this metal but not as much as it would like to. Dr. Saltonstall stated that the NAMF was the only organization representing the plating industry on the NPA, and had succeeded in getting the small amounts of nickel used. With the world's supply most inadequate, the military and atomic works programs are taking 25% of nickel for plating purposes with the automotive industry using 50% of the quantity allowed by NPA of the 25% specified from the base period.

The speaker felt that white brass was a satisfactory substitute for nickel plating but left a lot to be desired. He was optimistic about the lessening of controls on nickel by the second

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quarter of 1953, and said that with the production of nickel constantly being increased, the present situation should change considerably in five years.

Dr. Saltonstall's remarks were concluded with the statement that heavy protective coatings of nickel will be developed in the future, particularly for the chemical and food processing industries.

After an interesting question and answer period, the Udyllite Company acted as hosts for our usual social hour.

#### Los Angeles Branch

Plating shop waste disposal problems were discussed by Dr. Leslie E. Lancy of Elwood, Pa., in a talk presented at the November 12th meeting of Los Angeles Branch of the American Electroplaters' Society, which was held in Rodger Young Auditorium, Los Angeles.

Dr. Lancy is a graduate of Hungarian University in Szeged. He has done considerable work for concerns both in this country and in Europe in the electroplating fields. He holds memberships in the A.E.S., Electrochemical So-

ciety, Electrodepositors' Technical Society, and the Pennsylvania Sewage and Industrial Waste Association.

His talk dealt with practical phases of shop waste disposal which confront the average city plating plant operator who must discharge his waste products into municipal sewer systems. He discussed various types of waste disposal installations (illustrated with illuminated slides), the engineering costs of equipment for waste treatment, operating costs, and accepted methods for neutralizing concentrations before disposal.

Dr. Lancy declared that installations as well as the labor costs for properly maintaining adequate waste treatment systems are so high that the smaller plating shop owners find it difficult to make their budgets cover such systems. He has found, he said, that in some shops the waste treatment installation cost ten times that of the actual plating and polishing equipment. That high-cost situation, he declared has prompted him to experiment with the development of cheaper and more economically operable waste treatment systems.

The speaker described what may and may not be done by plating shop

owners in various sections of the country with respect to disposing of their waste products. He discussed, in order, products discharged into rivers and streams where they may kill fish; poisonous waste disposed into streams or lakes used as sources of water supply; and corrosive wastes discharged into city sewer lines where they may damage the piping.

Dr. Lancy emphasized that all plating shop operators in a community should regard adherence to industrial waste disposal regulations as a joint problem. He cited a case in Toronto, Canada, where one shop owner discharged cyanide solution in violation of municipal regulations and as a result brought the entire plating industry of the city into disrepute with the authorities.

In a list of "What Not To Do" which the speaker cited, he warned against dumping any concentrated waste material without using a neutralizer. He also presented various formulae for diluting poisonous solutions to below the toxic limit required by law.

The business session was called to order by President Myron Orbaugh immediately after the close of the edu-

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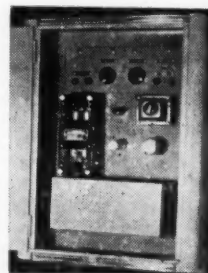
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ational hour. Sergeant-at-arms George Hetz introduced the guests, which included Alex Worman of Solventhal Chemical Co.; Don Steel, California Metal Processing Co.; Jack Murietta, Kayan Mfg. Co.; Robert Becker, Modern Plating Co.; George Mitchell, Standard-Thomson Corp., Dayton, O.; Gerald A. Lux, Oakite Products, Inc., New York; Ernest J. Hinterleitner, consulting engineer of Fanwood, N. J.; William Johnson, a member of Chicago A.E.S. Branch; and Kenneth Clayton, Wyandotte Chemical Co.

Michael Baker and James Soule were initiated into membership. Applications for membership were submitted by Robert Beck, C. F. Marshall, Jack Murietta, H. A. Born, Jr., Alex Worman, Kenneth W. Clayton and Stanley Critzek.

Earl Coffin, chairman of the Research Committee, reported that one new sustaining membership had been obtained during the past month—Virtue Brothers of Los Angeles.

George Hetz, reporting for the committee arranging the annual educational session and dinner dance, announced that March 21, 1953, had been selected as the date, and the new Statler Hotel

in downtown Los Angeles as the site. Morning and afternoon technical sessions, a noon-day lunch and social hour, and a dinner dance in the evening will constitute the program, along with a products and equipment exposition.

## OBITUARIES

### FRANK J. CLARK

Frank J. Clark, pioneer salesman with the Hanson-Van Winkle-Munning Co., Matawan, N. J. and a leading figure in the electroplating industry, died recently in Plainfield, N. J. at the age of 72.

Mr. Clark had been in the electroplating industry since the early part of the century and with Hanson-Van Winkle-Munning and its predecessor companies some 40 years when he retired in 1948. He was one of the founders of the International Fellowship Club (now Metal Finishing Suppliers Association, Inc.) of the American Electroplaters' Society and a founder and charter member of both the Boston and Springfield Chapter of the A.E.S. He



Frank J. Clark

had been granted an honorary life-membership in that organization.

### CHARLES H. ELDRIDGE

The many friends of Charles H. Eldridge will be saddened to learn of his death on October 10. Mr. Eldridge, or "Charlie" as he was affectionately known to the innumerable friends made during his many years traveling for United Chromium, Inc., had a

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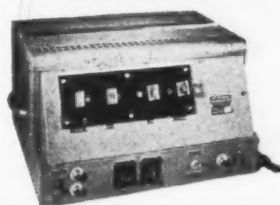
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most interesting career in the field of electrodeposition. It started with the Chile Exploration Co. where, associated with Dr. Colin G. Fink, he worked on the invention of the insoluble anode for electrolytic copper refining. Moving on to Dr. Fink's laboratory at Columbia University, Mr. Eldridge participated in the restoration of priceless ancient bronzes for the Metropolitan Museum of Art by electrolytic treatment. He assisted Dr. Fink in the early research which led to the establishment of chromium plating as a practical, commercial plating process.

Mr. Eldridge directed the operation of the first job plating shop for chromium plating, the Center Street Plant of the Chemical Treatment Company in New York City. From New York, in 1925 he went to Detroit as Technical Director of the newly founded General Chromium Corporation, and later was active in the research and service work of United Chromium, Inc. Until his retirement from active work in 1949, Mr. Eldridge was continuously engaged in a career devoted to chromium plating and its development and improvement.

Charles H. Eldridge was one of the real early pioneers in chromium plating who contributed in a major way to its development from a laboratory curiosity to a commercial operation of major proportions. His contribution toward the growth of the plating industry during the past three decades is attested by the numerous technical papers and patents in his name. Mr.

Eldridge is survived by his son and daughter, Mr. Colin Eldridge of Salt Lake City, Utah, and Mrs. Henry Strickland of Orinda, Calif.

#### R. S. ROELLER

*Russell S. Roeller*, general sales manager of the *Pennsylvania Salt Mfg. Co.*, died today after a brief illness in the Phoenixville, Pa., hospital. He was 60 years old.

Last week Mr. Roeller had been honored for his 30 years of service with Pennsalt at a luncheon with company executives. One of the best-known figures in the industry, Mr. Roeller had established a nation-wide acquaintance throughout all industries using chemical commodities.

Mr. Roeller joined Pennsalt as a salesman in 1922, after previous sales and industrial experience which included two years as an employee of British Ordnance prior to the United States entry into World War I. He was appointed Pennsalt's Philadelphia district sales manager in 1933 and became field sales manager in 1942. He assumed additional administrative duties with his appointment as assistant general sales manager in early 1950 and soon thereafter was named general sales manager.

Long active in chemical trade organizations, Mr. Roeller was a member of the board of directors of the Chlorine

Institute and of the National Production Authority's Alkali-Chlorine Committee. During World War II he served as a member of the Army-Navy Munitions Board Advisory Committee.

A native of Royersford, Pa., Mr. Roeller was a resident of Phoenixville and active in community activities for many years. He is survived by his widow, Mrs. Miriam R. Roeller. Burial was in Cheltenham Abbey, Washington Lane, Philadelphia.

#### JOHN J. McCLOSKEY

*John J. McCloskey*, 32, of Charlottesville, Virginia, died suddenly on Sunday, October 26, 1952.

At the time of his death, he was technical sales representative for *Nopco Chemical Co.* in the Virginia-Maryland area.

Mr. McCloskey graduated from the University of Virginia in 1942, and had been associated with Nopco since 1946.

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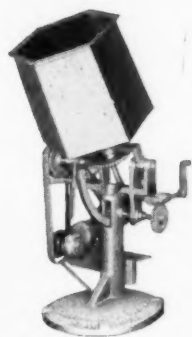
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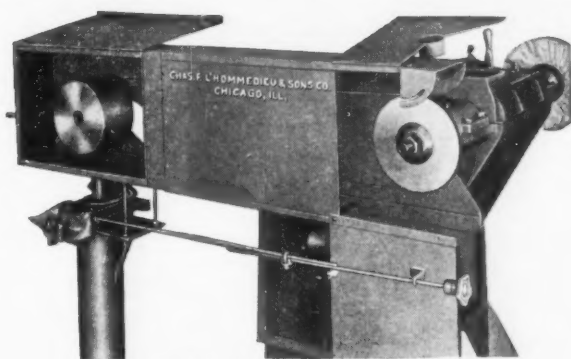
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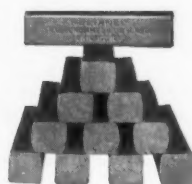
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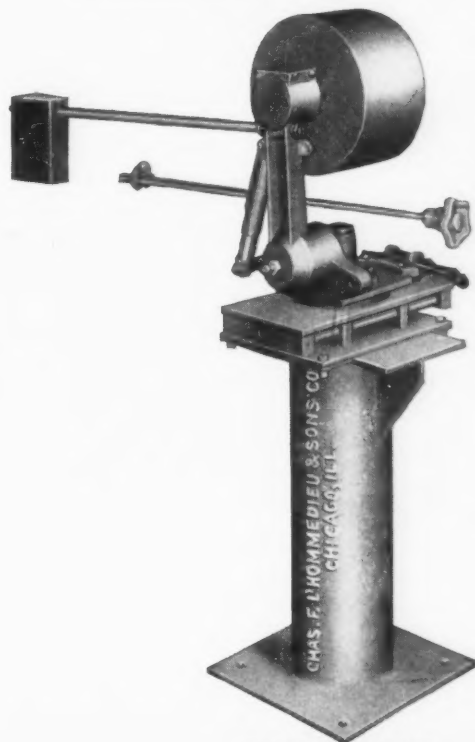
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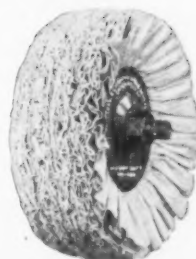
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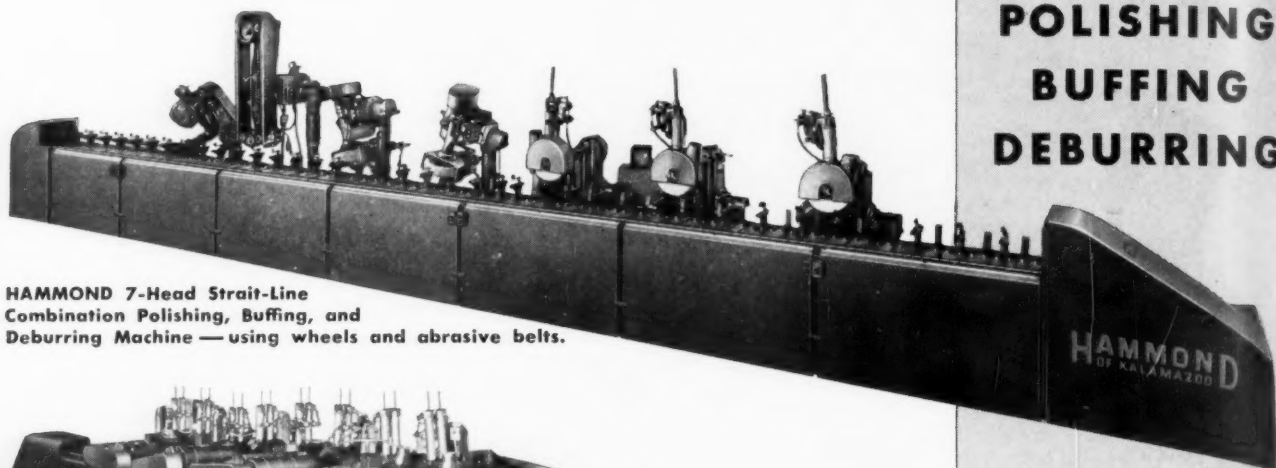


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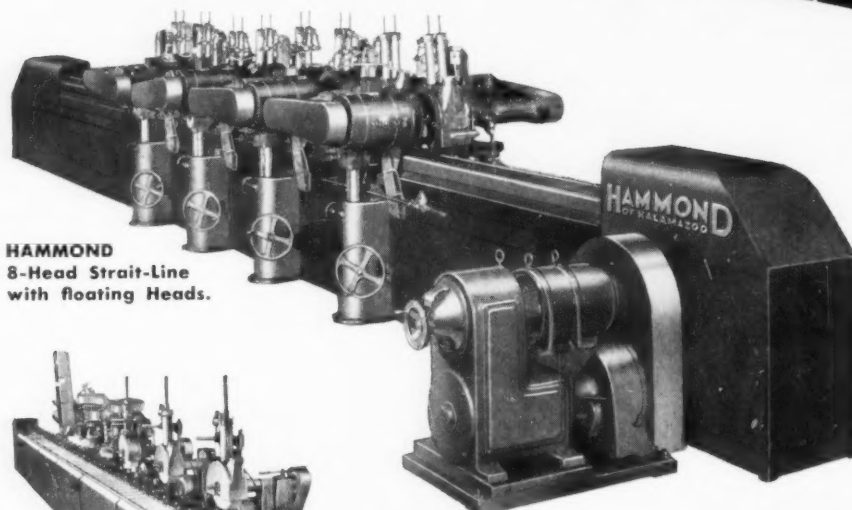
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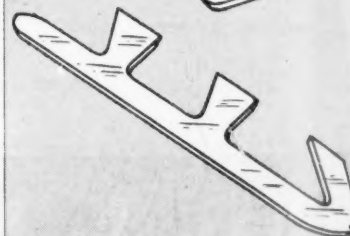
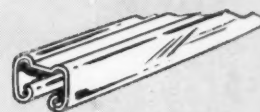
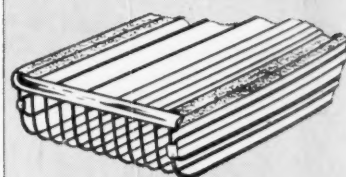


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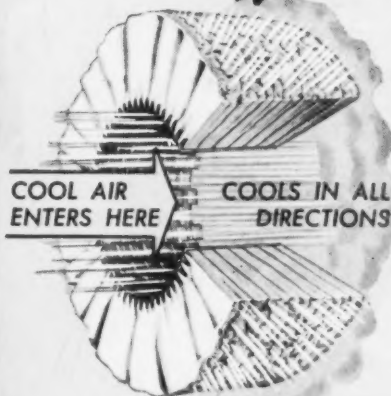
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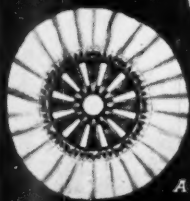
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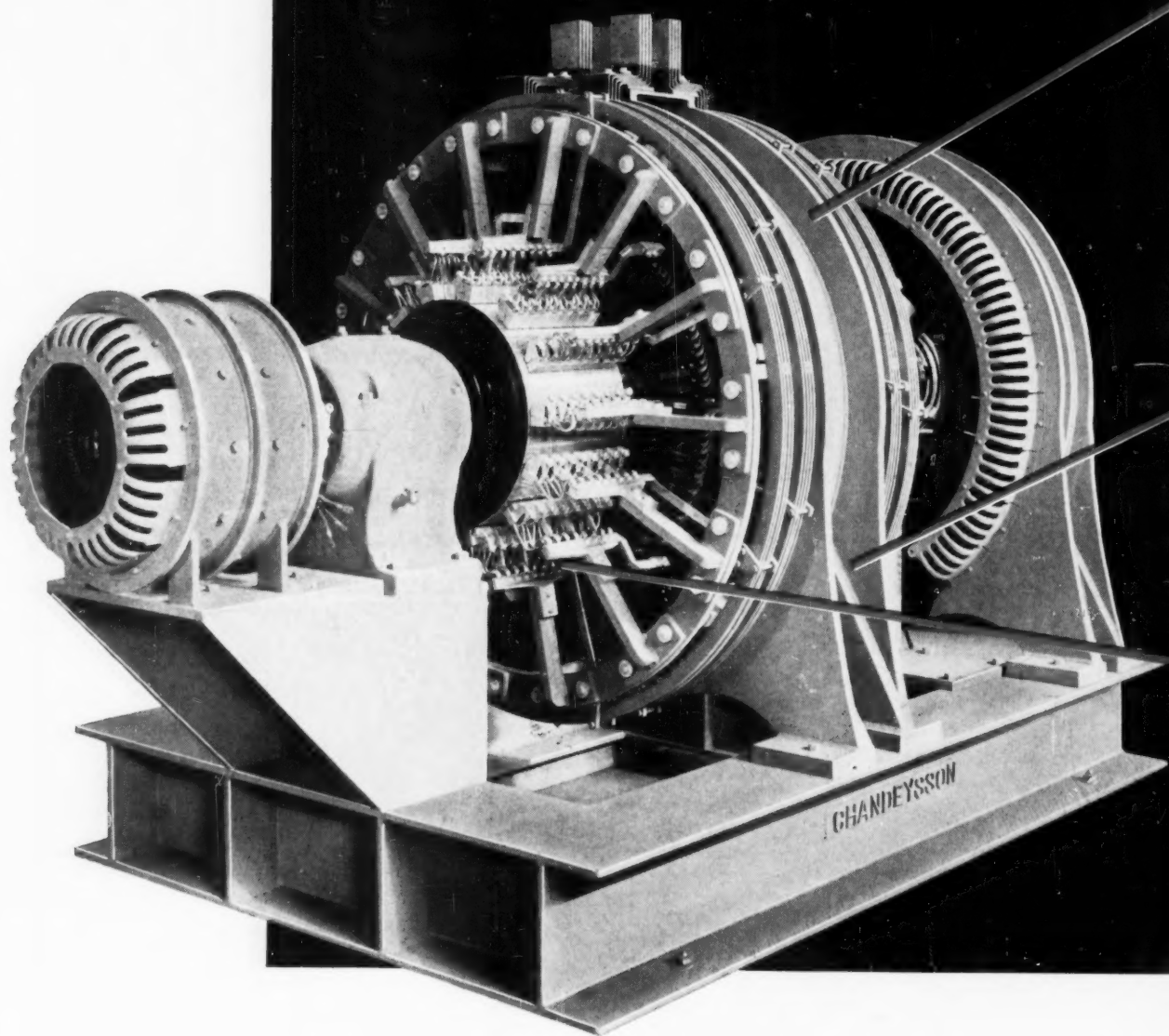
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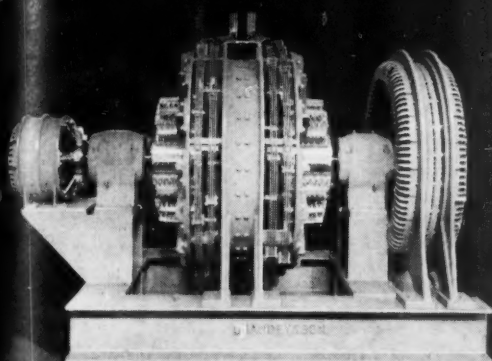
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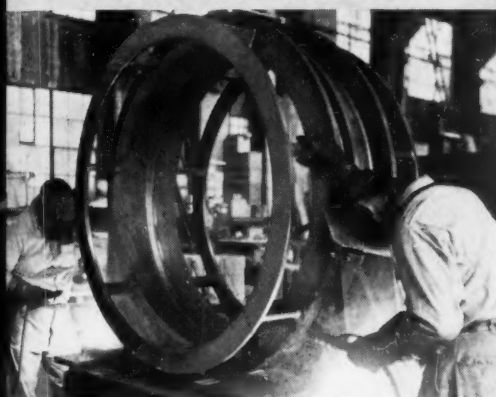
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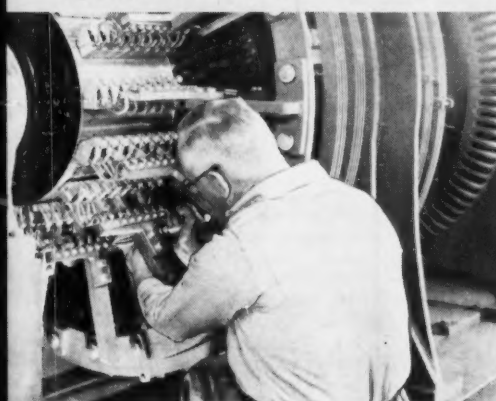
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- Completely and easily accessible

Chandeysson's newest motor-generator again sets the pace for industry.

Chandeysson has led in designing and building fine generators for over 50 years. Previous contributions pioneered the development of low-speed generators using synchronous motors, two-bearing construction and other features which have become standard today.

The new unit features all-welded steel construction for strength, accessibility and higher efficiency. Brushes, coils and commutator are completely and easily accessible.

Chandeysson motor-generator sets are available for reasonably quick delivery. Write today.

*Important!*

**SEE PAGE 83**

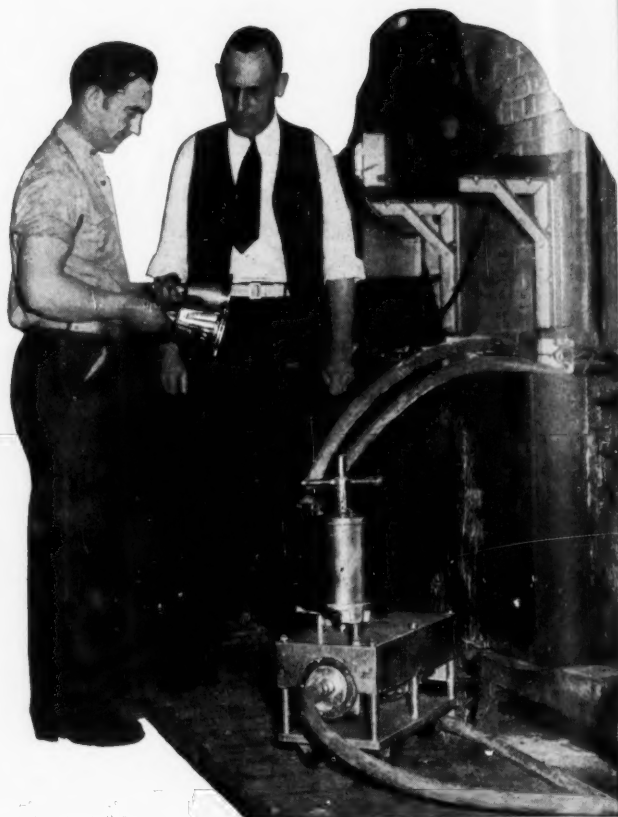
*Chandeysson*

**ELECTRIC COMPANY**

4084 BINGHAM AVE. • ST. LOUIS 16, MO.

# You can cut your losses

you can get better  
finished plated work  
save time and labor



## With an Alsop "Sealed Disc" Filter

*It protects your plating solutions against all impurities*

More and more cost-minded platers depend on Alsop "Sealed Disc" Filters to remove dirt, dust, and sludge from their plating solutions. They get better finished plated work — they save time and labor, and their plating solutions last longer.

The "Sealed Disc" Filter assures positive, trouble-free performance that's proof against even the invisible impurities that cause nodules and porousness, proof against losses caused by rejects and reworking. "Sealed Disc" Filters were designed especially for plating rooms. They are smaller, compact, and more portable than ordinary conventional filters. They are capable of handling equal volumes of solutions. "Sealed Disc" Filters are also performing satisfactory results on many acid dips, electro cleaners, and solvents.

Regardless of the size or type of your installation, there's a "Sealed Disc" Filter "to fit your job" — Write for complete information or contact your regular plating supplier.

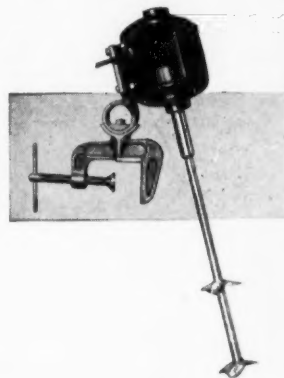


*Filters · Filter Discs · Sheets · Mixers · Agitators*

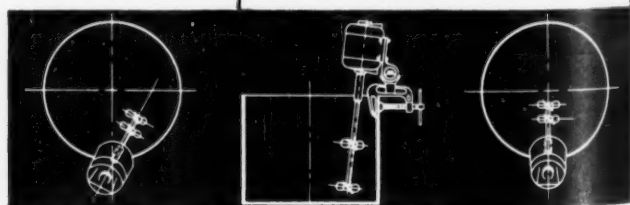
712 Bright Street

Milldale, Connecticut

### ALSOP PORTABLE MIXERS for every liquid mixing job



We manufacture a full line of Mixers and Agitators covering a complete range of sizes, propeller combinations, and speeds for mixing, blending and dissolving. Stainless Steel Tanks with permanently attached Mixer are also available as complete mixing units, in a wide range of capacities for thorough uniform mixing. Write for complete details.



Alsop Portable Mixers can be easily attached to any container.



## Here's how PR and Wes-X<sup>®</sup> give exceptionally level deposits of bright copper



... because this equipment controls the pulse of the PR Process\*. You see by reversing the current periodically and including H-VW-M's Wes-X addition agent in the bath, you get a cyanide copper deposit that is smoother, brighter with unusual levelling properties. The surface is so smooth that preliminary polishing of steel parts and subsequent buffing operations can be greatly reduced. PR and Wes-X copper is also being used successfully as a substitute base for chrome plating.

And here are some additional advantages with PR and Wes-X: Higher current densities are possible, denser metal structure with greater corrosion resistance, heavier deposits without buildup of trees and nodules, and even better anode corrosion due to the periodic change of polarity. Effective plating speed is exceptionally high.

PR plating with H-VW-M Wes-X is only one of many results of over eighty years of constant electroplating and polishing development—a continuing policy summed up in H-VW-M Platemanship... your working guarantee of the best that industry has to offer—not only in plating processes—but in every phase of plating and polishing.

\* PR Plating Process is a development of Westinghouse Electric Corp., covered by Patents #2451340 and #2451341. License Agreements are available through H-VW-M.

8653



Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

For full information on Wes-X bright copper plating and the PR Process\* ask for Technical Instruction Bulletin.

**HANSON-VAN WINKLE-MUNNING CO., MATAWAN, N. J.**

PLANTS AT: MATAWAN, N. J. • ANDERSON, INDIANA  
SALES OFFICES: ANDERSON • BOSTON • CHICAGO • CLEVELAND  
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# H-VW-M



INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

METAL FINISHING. December, 1952

RAPID ELECTRIC COMPANY

MANUFACTURERS OF SELENIUM RECTIFIER POWER SUPPLIES, CONTROLS AND REGULATORS  
2881 MIDDLETOWN ROAD  
NEW YORK 61, NEW YORK

Dear Friend,

Saying "Hello" is always a  
real pleasure.

It is especially satisfying  
at this time of the year, when we all  
take a little time out to think of the  
full meaning of friendship.

With deepest gratitude for  
yours, I want to wish you a very merry  
Christmas, with health, happiness, and  
prosperity in the year ahead.

Sincerely,

*James A. Viola*  
James A. Viola  
President

REMEMBER.....



**RAPID  
ELECTRIC CO.**

MEANS

*"More power to You!"*

# Cowles

## for longer life cleaning

HS is an anhydrous, silicated, heavy-duty soak and barrel cleaner of medium alkalinity.

It is formulated to give maximum cleaner life with extraordinarily heavy soil loads. HS contains no soaps... is free rinsing and produces no undesirable scums on acid and rinse tank solutions. HS allows separation of the oil and removal of such oil from the detergent environment when an overflow principle is used.

HS is particularly recommended wherever production specifications demand large amounts of oil removed from in-process parts.

Write for complete information.

*Prompt shipments from  
convenient warehouse stocks.*

**COWLES CHEMICAL COMPANY**

**METAL CLEANER DEPARTMENT**

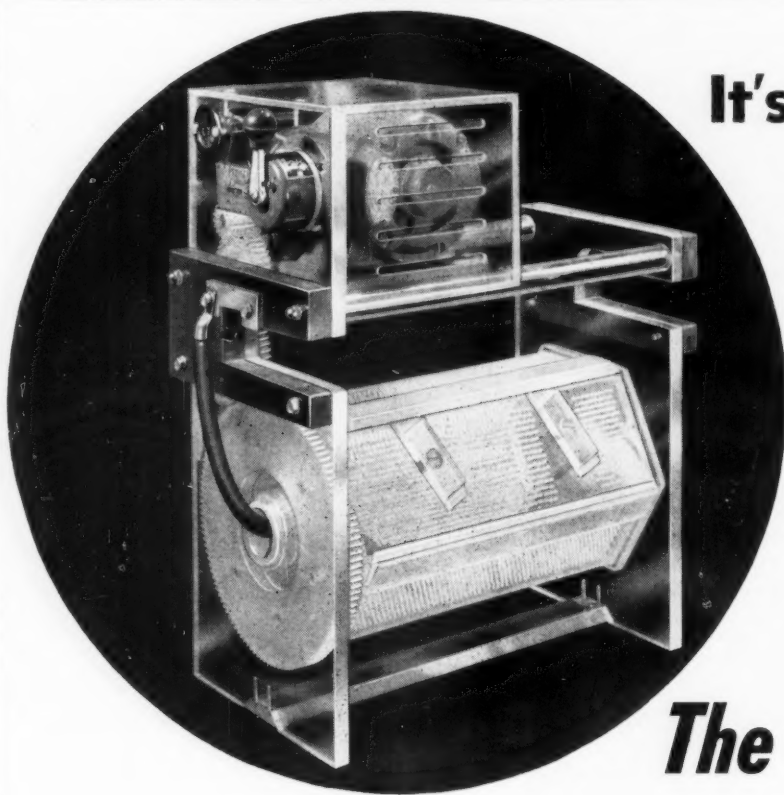
7016 Euclid Avenue

Cleveland 3, Ohio



**COWLES  
TECHNICAL  
SERVICE**  
gladly furnished upon request





It's **NEW—**

**NEW—**

**NEW—**

**NEW—**

*The 1953 Model*

# **PORTABLE Lucite Plating BARREL!**

THE STUTZ PORTABLE PLATING BARREL is designed and constructed of High Temperature Lucite to provide continuous processing of piece parts through the operations of Alkali Cleaning, Water Rinsing, Acid Treatment and Plating. Progression through these operations is made by manual handling or if necessary with the assist of an overhead traveling hoist. The Stutz Port-

able Plating Barrel is made in 2 sizes with cylinders having inside dimensions of 6" x 12" and 8" x 18". Standard perforations are 3/32" or larger. Smaller openings can be furnished as required. All gears are 1/2" High Temperature Lucite. Gear bearings are permanently lubricated. New heavy duty motor. Operating temperature up to 185°F.

Write for our new  
illustrated literature  
**TODAY!**

**GEORGE A.**

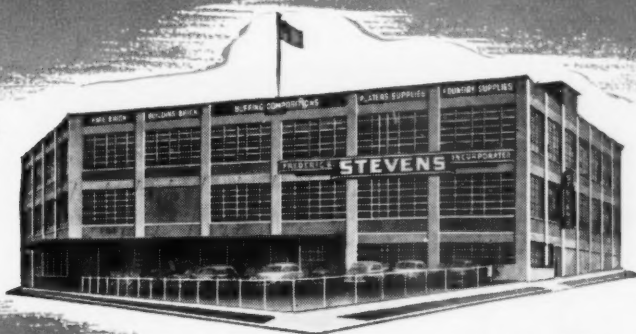
1645 CARROLL AVENUE



**MFG. CO.**

CHICAGO 12, ILL.

Manufactured by



*Best Wishes  
for a Happy Holiday  
and Prosperous New Year*

## *Our 70th Yuletide Message to Our Customers and Friends*

We of Frederic B. Stevens Inc., wish you a most joyous Holiday Season and unbounded good fortune during the coming year.

We wish to thank you for entrusting your business needs to our organization. We are deeply grateful for the loyalty you have shown to us . . . and we are proud to count you among our friends.

So please accept these Holiday Wishes for health, happiness and good fortune . . . and add to them a sincere "Thank You" from all of us at Frederic B. Stevens Inc.

METAL FINISHING EQUIPMENT AND SUPPLIES SINCE 1883

**FREDERIC B.**

BUFFALO • CHICAGO • CLEVELAND  
INDIANAPOLIS • NEW HAVEN  
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**STEVENS**  
DETROIT 16, MICHIGAN

**INCORPORATED**

FREDERIC B. STEVENS OF CANADA, LTD.  
WINDSOR • TORONTO  
ONTARIO





# News about COATINGS for METALS

Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

## Zinc Finish Bright as Chromium

### Chromate protection against corrosion

Protecting zinc or cadmium plated steel or zinc die castings is easy, economical and can meet Government specifications when you use one of the Unichrome Dips. Several different ones are available to produce black, yellow, olive drab, or brassy-yellow coatings which give required resistance to salt spray and exposure. This chemical process is adaptable for manual or automatic operation.

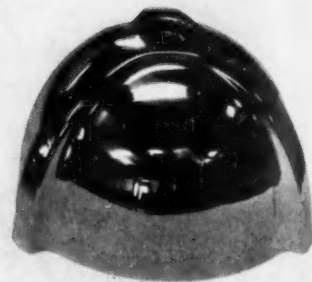
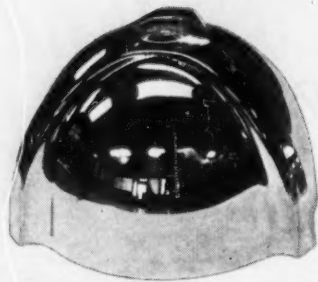
### Zinc, too, can be anodized

The Anozinc\* process, using conventional plating equipment, produces black, yellow or clear chromate type coatings on zinc plated parts by means of current. It provides a finish with not only the desired corrosion resistance, but also superior toughness while still wet. This means that parts can be handled at once without tying up space for storage and drying. Zinc plated steel shell cases are being turned out at a fast clip with this process, as are propeller blades and other vital work. Write for data.

\*Trade Mark

### BIG ADVANTAGE IN HARD CHROMIUM PLATING

Chromium plating of vital parts reduces friction, wear and corrosion. At the same time, it is known to reduce fatigue strength of high strength steel. However, the loss of fatigue strength can be minimized by using a Unichrome S.R.H.S. Chromium Plating Bath. As reported by an independent research laboratory, specimens plated in an ordinary chromium bath showed a 25.7% loss of fatigue strength, whereas those plated in the Unichrome S.R.H.S. CR-110 Bath exhibited only 7.6% loss. DESIGNERS PLEASE NOTE.



Unretouched photograph. Casting on left was buffed, zinc plated and treated in Unichrome Clear Dip. Casting on right was buffed and plated with copper, nickel and chromium. They're hard to tell apart.

### Successful finishing system used on wide variety of steel and die cast products

● Bright finishes which combine a treated zinc plate with organic coatings are here to stay. No longer can they be classed merely as substitutes. Used through sheer necessity at first, they have established themselves as a quality finishing method for a wide line of products.

One of the most outstanding among these combination finishes, as indicated by users' experiences, is the Unichrome Clear Dip Finish. In some cases, it has actually resulted in a higher quality finishing method than the one replaced. In other cases, its economy has permitted use of an eye appealing finish even on low cost items—such as screws, wire goods and small parts of other products.

#### THREE STEPS TO ACHIEVE THIS FINISH

Zinc plating the product comes first, of course. Usually only .0002" to .0005" of zinc suffices. Since zinc by itself doesn't stay bright, step two is chemical treatment of the zinc plate in Unichrome Clear Dip solution. It emerges with chromium-like brightness. With greater resistance to corrosion and better paint holding properties, too. The Unichrome Dip Finish is integral with the zinc. It retains its brilliance and resists conditions which cause zinc to turn dull, finger-mark or develop white rust.

Write to United Chromium for more information on coatings for metals. Detailed bulletins available.

#### UNITED CHROMIUM, INCORPORATED

100 East 42nd Street, New York 17, N. Y. • Detroit 20, Mich. • Waterbury 20, Conn.  
Chicago 4, Ill. • Los Angeles 13, Calif. • In Canada: United Chromium Limited, Toronto, Ont.

#### AN UNUSUAL FINISH FROM ALL ANGLES

Users find the brightness of Unichrome Dip unusual. Likewise its economy—with some products being treated for a fraction of a penny's worth of materials per square foot. Operating costs are low, too. The Unichrome Clear Dip Process is fast, easy to control, and adaptable to manual or automatic operations.

Naturally, the better the organic coating which is applied, the better the whole finish becomes. In this also, users have found the unusual—Unichrome Clear Enamels.

#### HOW GOOD CAN AN ORGANIC COATING BE?

Here's a case to illustrate the exceptional durability that Unichrome Dip Finish gets—or any other bright finish for that matter—when protected with Unichrome Clear Enamels.

Over 70 clear coatings for bright finishes were subjected to year-long Florida exposure tests by a well known company. Most were baking types. Unichrome Coating A-140 was one of the few air-drying coatings. It was applied in a thickness of 0.4 mil as against 0.8 for the others. Despite this, it was the coating that stood up best by far in the entire test group, being good as new at the end of the test.

Unichrome Clear Enamels like this make it possible to increase the corrosion resistance of bright metal finishes.



*for Better Plating Results*

*Change to* **N-R**

**SEYMOUR'S**

*Cold Solution Type*



## BARREL NICKEL BRIGHTENER

SEYMOUR'S N-R Bright Nickel for cold bath solutions saves you money and gives more uniform deposits in barrel plating of small articles. With an original addition of only 3 to 5 fluid ounces of N-R per 100 gallons of solution, a clean, even, decorative deposit of bright nickel up to .0001" can be obtained. Only 1 to 2 fluid ounces of N-R are needed per 100 gallons per load of work thereafter.

Seymour N-R cold type Brightener is simple to maintain and easy to control. Deposits are adherent to properly cleaned base metals, except zinc base direct, and may be chromium plated without prior buffing or wiping. Write for Bulletin No. 8 containing complete details.

Other Seymour Bright Nickel Processes are available for specific plating needs. Tell us your requirements.

### *Distributors*

BART-MESSING CORP.,  
229 Main St., Belleville 9, N. J.

CROWN RHEOSTAT & SUPPLY CO.,  
3465 N. Kimball Ave., Chicago, Ill.

EATON CHEMICAL & DYESTUFF CO.,  
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70 Clifford St., Providence 3, R. I.



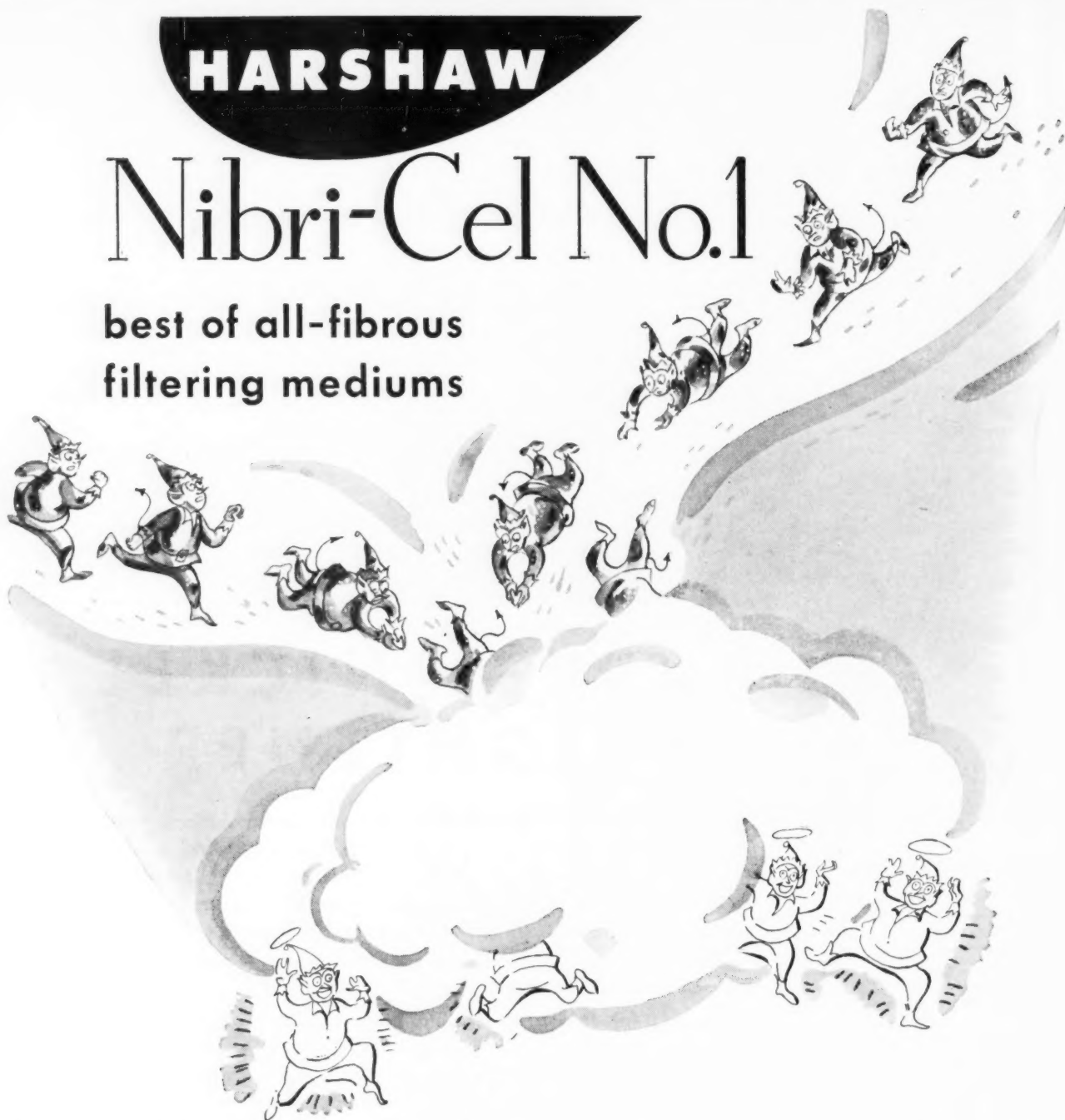
THE SEYMOUR MANUFACTURING COMPANY, SEYMOUR, CONNECTICUT

# SEYMOUR

**HARSHAW**

# Nibri-Cel No.1

best of all-fibrous  
filtering mediums



- ★ Made of 100% pure fibrous cellulose
- ★ Exact fibre lengths maintained, permitting "sharpness" of filtration
- ★ Blended by a new-type machine which insures uniformity
- ★ Forms easily-cleaned layers which do not "slough-off"

- ★ Provides efficient depth filtration
- ★ Quickly forms a pre-coat on either screen-type filters or cloth and paper dressed presses
- ★ Rapid forming of pre-coat offers tremendous advantages in "setting"

- ★ Eliminates clogging of cloth and screen wires
- ★ Fibrous structure maintains steady flow through the filters
- ★ Especially adapted to low-cost clarification work

**NOTE:** When Nibri-Cel No. 1 is used, the filter is "set" by using only ½ oz. of material for each square foot of filter surface, rather than the usual 4 oz. per square foot recommended when using diatomaceous earth. Usually no addition of filter material is required on the run.

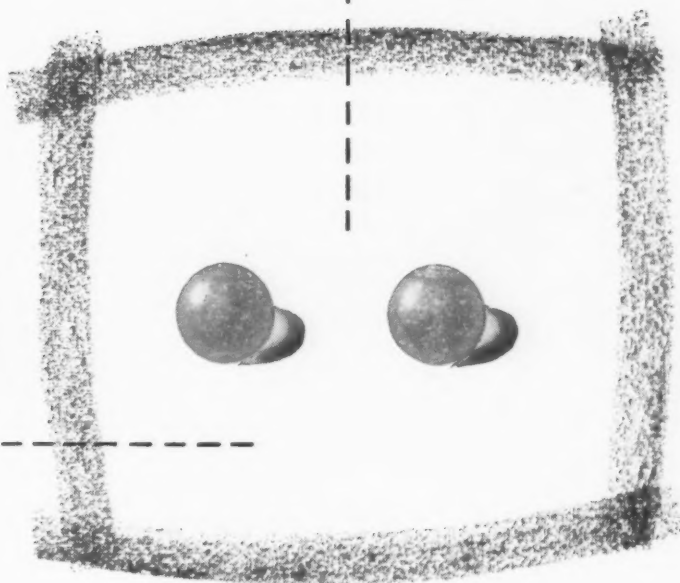
Order Nibri-Cel No. 1 Through Any Harshaw Sales Office

SEND ME a large sample of Nibri-Cel No. 1 for testing.

MY NAME \_\_\_\_\_ (Please Print)  
CO. NAME \_\_\_\_\_  
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HARSHAW  
CHEMICAL  
COMPANY**  
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CLEVELAND 6, OHIO

# Let's Talk about **PEAS**



## What have peas got to do with Rectifiers?

**JUST THIS:** you've heard the phrase "As alike as two peas". Well people who have anything to do with peas — farmers, packers, cooks, and just those who eat peas — know that peas *aren't* all alike.

The next time anyone says to you "Just as good as Green" remember that peas aren't all alike, and neither are rectifiers.

**If you want the best... buy GREEN !**



### **W. GREEN ELECTRIC COMPANY, INC.**

SELECTRO-PLATERS AND ALL TYPES OF RECTIFIER EQUIPMENT

GREEN EXCHANGE BUILDING 130 CEDAR STREET NEW YORK 6, N.Y.

RECTIFIER  ENGINEERS

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| • Industrial Chemical & Equip. Co., | Minneapolis  | • W. M. Fotheringham,            | Buffalo |





One of a number of different Tumbling barrels in which sample parts are processed in the new Norton barrel-finishing department.

## New Norton sample processing department helps manufacturers speed up production

Plan now to take advantage of this new enlarged service department.

If you'd like to find faster methods for deburring and forming uniform radii on vitally needed parts — or if you have special problems in finishing parts ranging from tiny needles to castings and forgings weighing several pounds — send us samples of your parts. Tumbling is very likely the answer to your problem. And the new Norton sample processing department is the ideal set-up for finding just exactly what you can accomplish through barrel-finishing. Many manufacturers have already realized substantial savings and speed-ups in production through this service.

This new Norton department has a variety of Tumbling barrels of different types and capacities plus auxiliary equipment such as a mechanically vibrated screen. Here, Norton production engineers determine for you —

without charge or obligation — just exactly what tumbling can do for the metal parts you send. Detailed recommendations are then given so that you can know exactly how to get the best results for your particular problem. These recommendations include barrel type, size and speed, size and amount of ALUNDUM\* Tumbling Abrasives to be used, amount of water, type and amount of compound or cleaner, time cycles and other data.

### Send Samples Now

For sample processing, we need: representative sample parts plus (a) the finished sample to be matched (hand-finished, if necessary) and (b) information on your present barrel-finishing equipment, if any, including type and size of barrel and barrel speeds. These should be sent to Norton Company, Worcester 6, Massachusetts, attention of Sales Engineering Department, Abrasive Division.

About a week is required for processing the samples after they have been received.

Meanwhile, for further information get the 55-page Norton handbook on barrel-finishing. Ask your Norton Distributor for Form 501 or write us direct.

\*Trade-Mark Reg. U. S. Pat. Off.

**NORTON COMPANY, Worcester 6, Mass.**

Distributors In All Principal Cities

Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

**NORTON**

**ABRASIVES**

*Making better products to make  
other products better*

# SAVE 90% OF CHROMIC ACID

## *Used in Anodizing*

Newly Discovered  
Permutit Process  
Helps to Conserve This  
Critically Short  
Material

1. Produces a more uniform corrosion-resistant surface on the anodized metal.
2. Lowers water consumption by recycling rinse water.
3. Eliminates waste disposal problems by removing impurities from the bath and chromates from the rinse water.

CHROMIC acid anodizing of aluminum used to be an expensive operation, because it wasted valuable acid. Now you can prevent this expensive waste with the NEW Permutit process for chromic acid recovery.

First, a Permutit Q cation exchanger removes contaminating metallic cations which would otherwise consume chromic acid in the bath solution. The chromic acid content remains uniform throughout. Regeneration of the Permutit Q is with cheap sulfuric acid.

The Permutit S anion exchanger removes all chromates from the rinse water. *No water containing chromates is sent to waste.* All chromates are returned to the anodizing bath.

In these days of high costs and critical shortages, the value of the recovered chromic acid will more than pay for the operation of this new Permutit process. The process is equally applicable to other metal working processes consuming chromic acid.

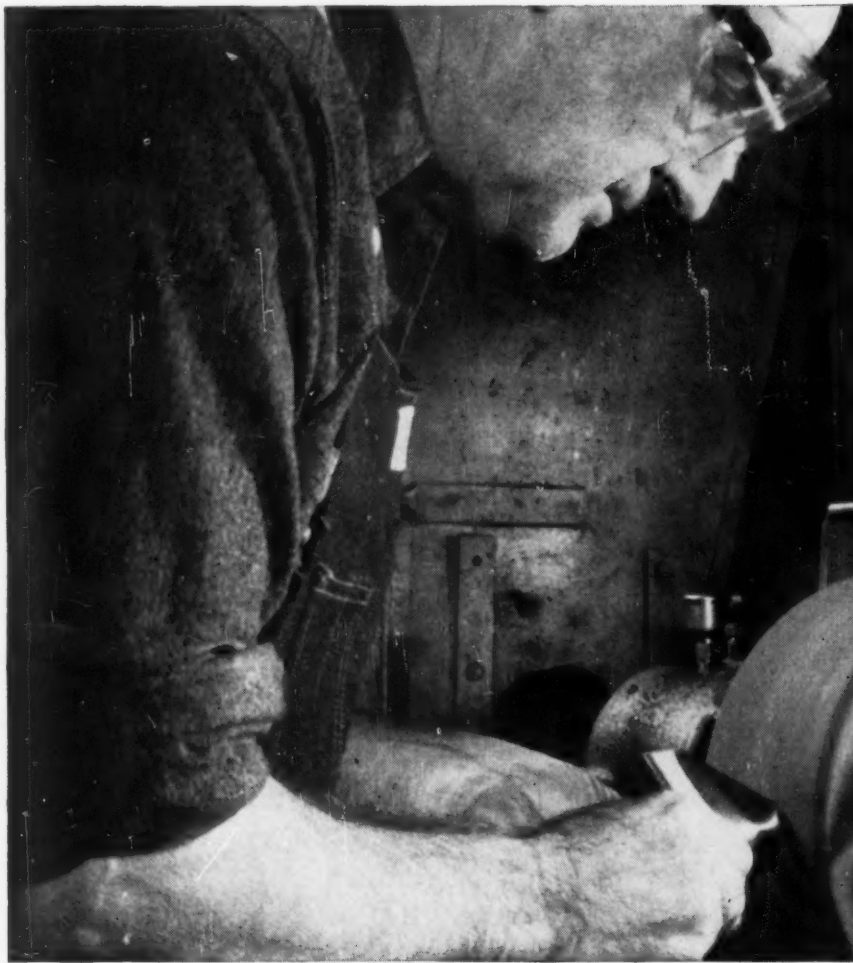
\* \* \*

For details, write to THE PERMUTIT COMPANY, Dept. MF-12, 330 West 42nd Street, New York 36, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

**PERMUTIT**<sup>®</sup>

ION EXCHANGE HEADQUARTERS FOR 40 YEARS





**ALOXITE TPW**  
*powder is the*  
**RIGHT abrasive for**  
*some polishing*  
**operations...**

...but the right one for  
**ALL** operations is bound  
 to be among the other  
 six in the complete line  
 by **CARBORUNDUM**

**ALOXITE TPW** powders, of aluminum oxide in grits 240 through 1000, are ideal for general purpose polishing operations wherever closely graded fine abrasives are called for. Their controlled structure, toughness and temper are your guarantee of precision performance. If that's your problem, ALOXITE TPW powders are *right* for you!

	GRAIN TYPE	CHARACTERISTICS	PRIMARY USES
<b>1</b>	<b>ALOXITE TP</b> Aluminum Oxide	Tough, blocky. Standard grit sizes from 16 through 220.	Polishing operations involving heavy stock removal on steel and other high tensile strength metals.
<b>2</b>	<b>ALOXITE TPT</b> Aluminum Oxide	Tough, sharp. Grits 16 through 100.	Polishing operations involving removal of large amounts of metal (e.g. plowshares).
<b>3</b>	<b>ALOXITE TPL</b> Aluminum Oxide	Very sharp, friable. Grits 16 through 220. (It fractures during use, thus reduces loading of the wheel surface.)	Polishing low tensile strength metals—copper, brass, bronze, aluminum.
<b>4</b>	<b>ALOXITE TPC</b> Aluminum Oxide	Medium sharp. Grits 16 through 220.	General purpose polishing grain—for removal of comparatively small amounts of metal.
<b>5</b>	<b>CARBORUNDUM RA</b> Silicon Carbide	Sharp, very friable. Grits 10 through 240.	Polishing cast iron.
<b>6</b>	<b>CARBORUNDUM RA</b> Silicon Carbide	Powder. Grits 280 through 600.	General purpose polishing.

FOR FREE BOOKLET, "Abrasive Grain and Powders," write to Dept. MF 83-57.

**Only CARBORUNDUM**  
TRADE MARK

**offers ALL abrasive products...to give you the proper ONE**

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York.





*Whether you purchase  
by the drum*

*or carload...*



# **NOW-AS ALWAYS-**

## **YOU PAY NO EXTRA PREMIUM FOR NIALK® TRICHLORethylene's TOP QUALITY**

Always a top quality product, NIALK TRICHLORethylene is your best buy for efficient, economical, metal degreasing. Niagara Alkali has never charged a premium price for NIALK TRICHLORethylene.

As always, you receive a high purity, high performance product with these special advantages:

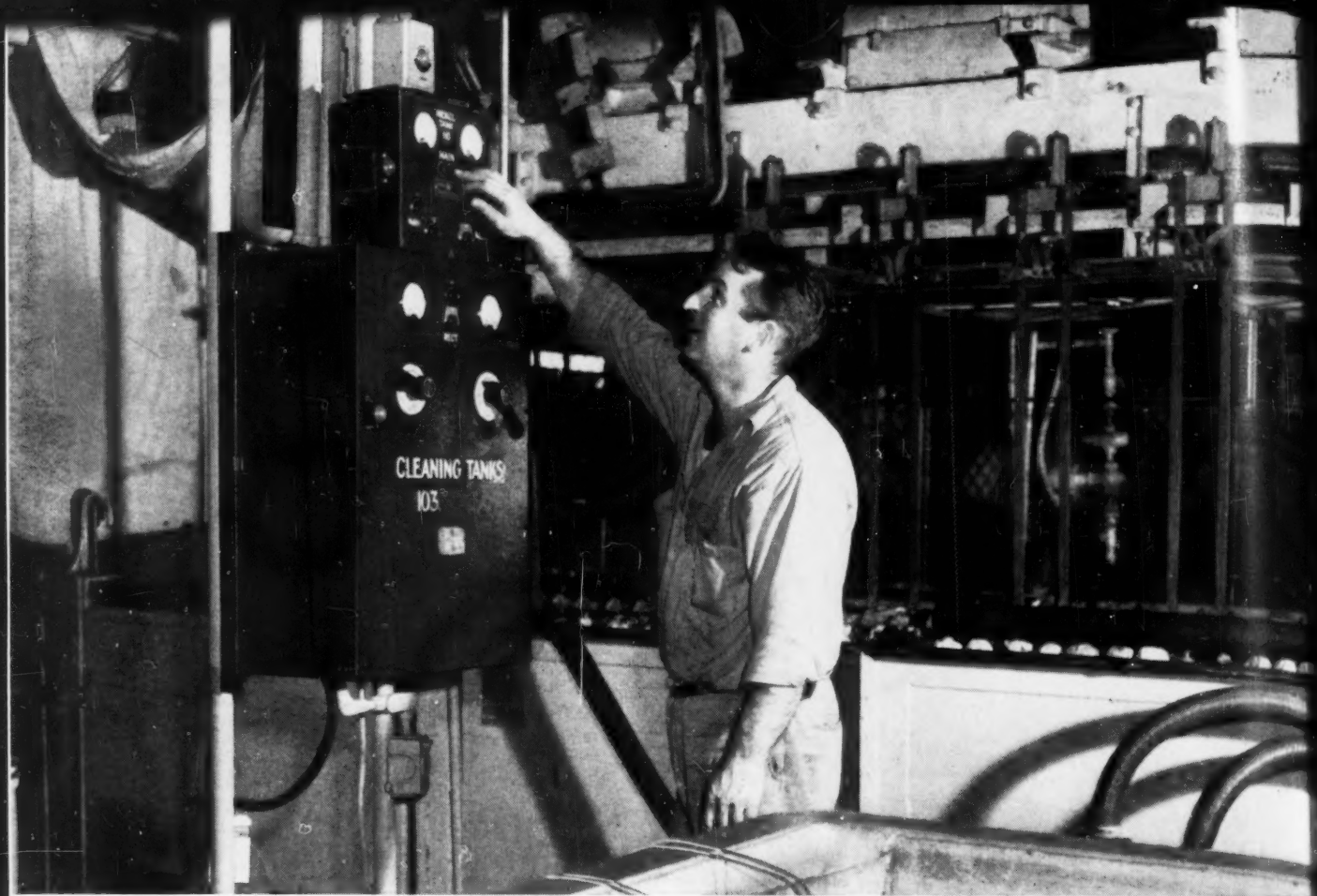
- **Cleans and dries in record time**
- **Requires less power consumption**
- **Has minimum vapor loss**
- **Is non-flammable . . . stable**

Make sure your metal parts are 100% grease-free. NIALK TRICHLORethylene leaves them clean, warm, dry, ready for immediate electroplating, painting, enameling, lacquering, rustproofing, heat treating, pickling, inspection, assembling.

### **NIAGARA ALKALI COMPANY**

60 East 42nd Street, New York 17, N. Y.

NIALK Liquid Chlorine • NIALK Caustic Potash • NIALK Carbonate of Potash • NIALK Paradichlorobenzene  
NIALK Caustic Soda • NIALK TRICHLORethylene • NIAGATHAL® (Tetrachloro Phthalic Anhydride)



CONTROLS FOR PLATING EQUIPMENT AT GILLETTE SAFETY RAZOR COMPANY ARE CONVENIENTLY LOCATED ADJACENT TO PRODUCTION LINE

## G-E Rectifiers assure steady production reports Gillette Safety Razor Company



**G-E PLATING RECTIFIERS**, installed in a separate room away from plating area, minimize maintenance. Only occasional inspection and cleaning are required.

### "No shutdowns of plating line from current failure"

General Electric metallic rectifiers supply d-c power for electrolytic cleaning, and nickel and gold plating of safety razors at the Boston plant of the Gillette Safety Razor Company.

An automatic conveyor system moves racks of razors through a series of twelve tanks and a dryer. In only 30 minutes, the razors are cleaned, electrolytically cleaned, rinsed, re-rinsed, acid rinsed, nickel plated, rinsed three times, and dried.

To operate with such precise timing, completely dependable equipment is a real necessity. That is why Gillette relies on G-E metallic rectifiers for its d-c power.

**STEADY PRODUCTION**—"Never have our G-E plating rectifiers caused a production shutdown due to current failure," reports Howard Spaulding, Chief Electrical Engineer at Gillette.

**EASY TO MAINTAIN**—"Furthermore, the G-E rectifiers require practically no maintenance—only occasional inspection of contacts and switches," Mr. Spaulding adds.

**SAVE POWER**—Because controls regulate d-c output by controlling a-c input, power is always adjusted to actual load requirements.

**FLEXIBLE**—Since plating rectifiers need no special foundations, units may be shifted for the most efficient arrangement, as requirements change. G-E plating rectifiers may be tier-mounted if space is at a premium, and additional units can be added if more power is needed.

**FOR MORE INFORMATION** about G-E metallic plating rectifiers, consult your G-E representative or write to Section 464-11, General Electric Co., Schenectady 5, N. Y.

**GENERAL**  **ELECTRIC**

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1. Pro  
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2. Pro  
for th  
prior



MET

**TWO SUPERIOR**

**NEW**

**FINISHES:**

# PROBRITE and PROBRITE CR-723 WHITE ALLOY

FAR more than a "substitute" for nickel, new Probrite White Alloy processes offer desirable characteristics of their own which challenge the use of nickel in the decorative plating field.

1. **Probrite**—A bright out of the bath addition agent system offered to those whose analytical facilities are such that control affords few problems. Equal or superior in color to bright nickel. Readily chromium plated.

2. **Probrite CR-723**—A "work horse," developed for those platers who are buffing nickel or copper prior to chromium plating. Easy to control, heavy

deposits at high current densities, readily buffed to a high mirror finish. Even for those who have use for Probrite "bright out of the bath" system, CR-723 has a place in every plating department.

These new "TWINS" of the electroplating industry when used with the Probrite Seal are a must for the metal finishing trade. The corrosion resistance achieved with Probrite White Alloy and Probrite Seal following chromium plating are outstanding. The Probrite Seal is a further advancement in corrosion history. Join the trend. Save money. Produce a better finish.

*Write for complete data and samples.*

**PROMAT**  
*Division*

**Poor & Company • 851 S. Market St., Waukegan, Ill.**





AMAZING TENSILE STRENGTH



PERMANENT FLEXIBILITY



CONTINUOUS ADHESION



RUGGED SCUFF RESISTANCE



POSITIVE INSULATION



DURABLE PROTECTION

When...

## THEY'RE MICCROSOL COATED

### They Meet the Highest Industrial Standards

**MICCROSOL E-1003** Heat-Cured Rack Coating is a 100% solids, non-evaporating material that produces a smooth, tough, leather-like coating which will often outlast the rack. Exceptional adhesion is achieved through the use of our primers.

In addition to the outstanding characteristics listed above, tests for abrasion and resistance to all commonly used plating solutions, acids, and caustics show superior performance in comparison to similar products. MICCROSOL E-1003 has proven to excel as a coating for materials-handling equipment, baskets, hangers, and a wide variety of plating equipment parts.

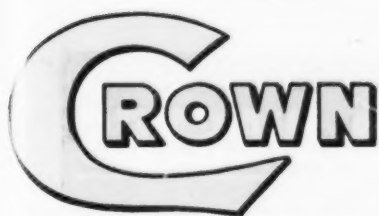
MICCROSOL E-1003 has an exceptionally high gloss, allowing free drainage, and no solution carry-over.

*We will be pleased to help you with your coating problems. Send us full particulars.*

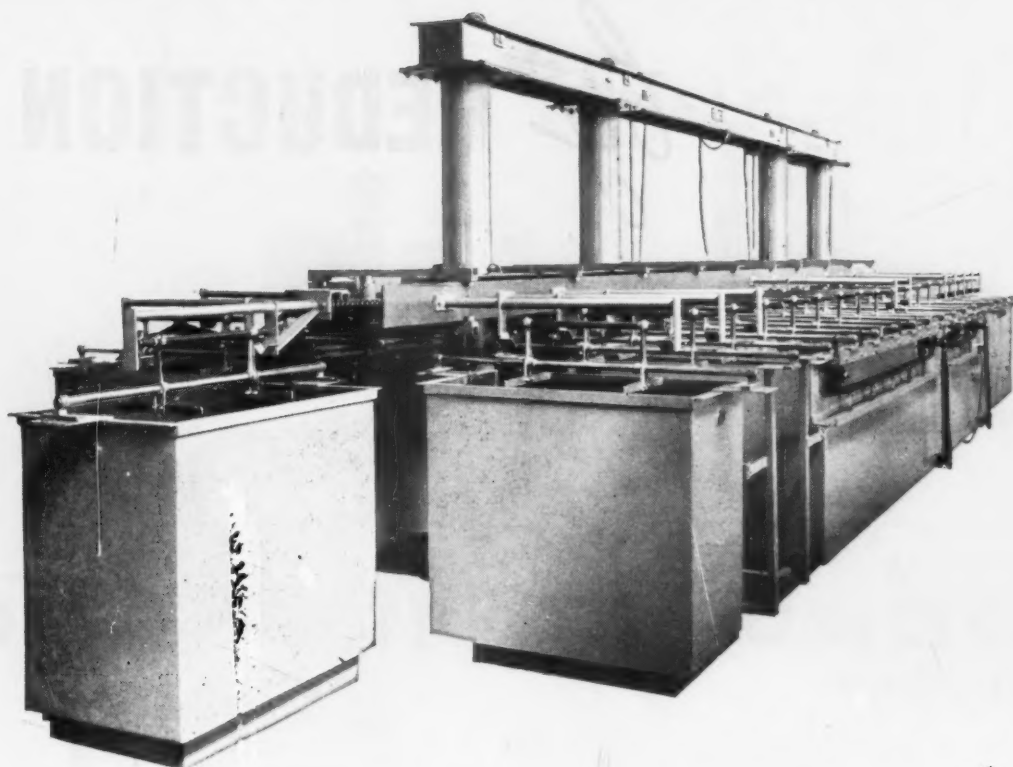


**MICHIGAN CHROME**  
*and Chemical Company*

6353 East Jefferson Avenue • Detroit 7, Michigan



## TYPE "B" AUTOMATIC



***you'll be agreeably surprised . . .***

- At the high production
- At the low cost
- At the high quality
- At the low rejections

Whether your plating requirements are for high production of small parts or moderate production of large parts, there is a Crown Type "B" machine that will automatically travel your work through the entire treatment cycle — on schedule.

*Write us details of your treatment cycle and production requirements for further information*

**CROWN RHEOSTAT AND SUPPLY COMPANY**

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

*treat*

## TOXIC CHROMIUM WASTES

*by*

## REDUCTION



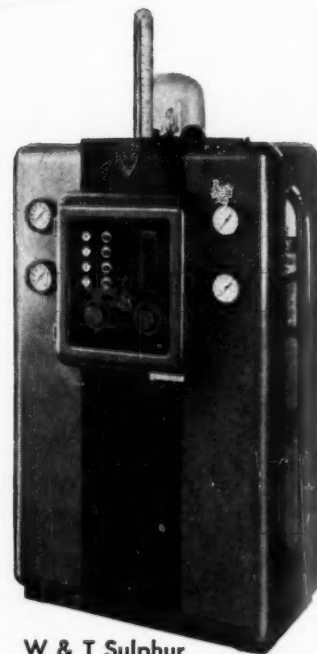
Chromium wastes, because of their toxicity and high color, are a problem for industry and an annoying source of stream pollution.

Reduction of toxic hexavalent chromium wastes to the trivalent form with sulphur dioxide, and subsequent precipitation with alkali, has become widely accepted in the plating industry. Wallace & Tiernan offers not only the equipment for feeding sulphur dioxide but also the experience of many installations to successfully carry out the reduction process.

### CYANIDE WASTES

Wallace & Tiernan's service to the metal finishing industry also includes experience and equipment for effective destruction of cyanide wastes by alkaline chlorination. Automatic control equipment assures complete cyanide destruction with minimum chemical costs.

Write today for additional information on Wallace & Tiernan equipment for the reduction of toxic chromium wastes with sulphur dioxide and the oxidation of cyanide wastes by alkaline chlorination.



W & T Sulphur  
Dioxide Feeder

## WALLACE & TIERNAN COMPANY, INC.

CHLORINE AND CHEMICAL CONTROL EQUIPMENT  
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

S-78



MORE ECONOMICAL . . . MORE DEPENDABLE!

# Electrolytic metal Cleaning

with

**DOW SODIUM ORTHOSILICATE**  
cleaning compound

You can lower your *electrolytic metal cleaning* costs and be certain of dependable results every time if you use Dow Sodium Orthosilicate cleaning compound. This cleaning compound saves you money by reducing labor and material costs and cutting rejects and double-cleaning to a minimum. You can be sure of consistent, high quality work.

Dow Sodium Orthosilicate cleaning compound is excellent for *electrolytic metal cleaning*, as solutions of this material have a very high electrical conductivity allowing any desired current density without excessive voltage. It is also invaluable for dip or soak, and steam jet metal cleaning. It readily emul-

sifies oils, fats and waxes. Insoluble materials are suspended and prevented from redeposition on the clean piece. It has a high acid capacity and a high pH which make possible heavy-duty cleaning. A quick, easy rinse leaves clean, bare metal that is all set for the final finishing operation.

If you want to save money, increase operational efficiency and be certain of dependable results every time, WRITE DOW TODAY for detailed information on Dow Sodium Orthosilicate cleaning compound. Begin immediately to take advantage of this excellent heavy-duty cleaner.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN





**A handful of aluminum  
makes hundreds  
of bike horns sparkle**

**by Vacuum Metallizing**

**T**his shiny horn would catch the eye of any young bike rider in the market. And the shine is put there quickly, easily, and using practically no coating metal.

It's high vacuum metallizing that does this so well, and DPi makes the equipment you need for full-scale production. Almost any coating metal can be used, and the process works just as well on inexpensive die castings as on the most expensive pieces.

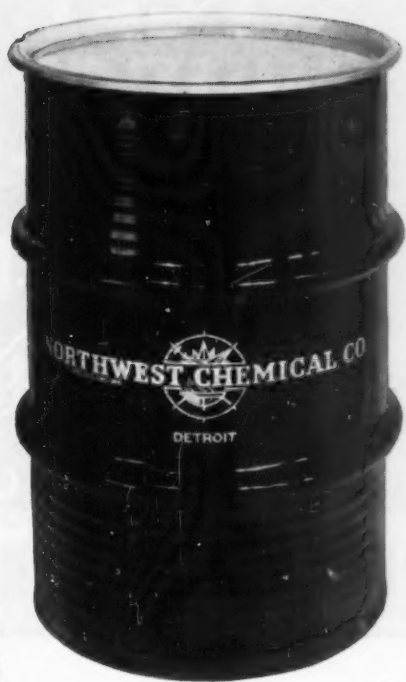
DPi high vacuum coating units are easy to use. After a base coating of lacquer, you load your product into the coating chamber (hundreds at a time in the larger units) and in a few minutes a thin film of brilliant aluminum is deposited. There's no buffing or polishing required—just a topcoat of lacquer for protection and to produce color effects if you wish.

To show you how vacuum metallizing can work for you, we would be glad to examine any metal items you would like to see vacuum coated. If we feel they have possibilities, our laboratory will coat some samples for you. After you have seen the results, we can talk about the equipment that will do the job on a production basis in your plant. Send your samples, or write for further information to *Distillation Products Industries*, Vacuum Equipment Department, 631 Ridge Road West, Rochester 3, N. Y. (Division of Eastman Kodak Company).



**high vacuum research  
and engineering**

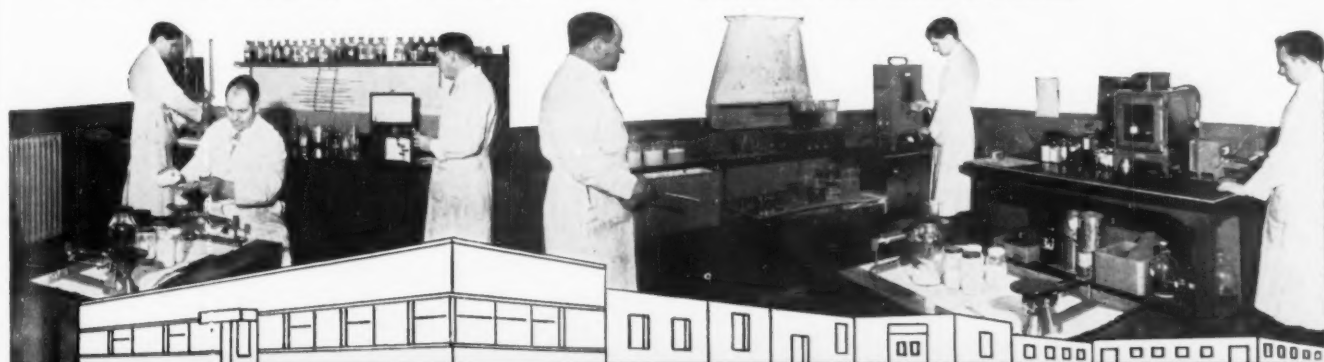
**DPi**



... on our Twentieth ANNIVERSARY  
we wish you a **Very Merry Christmas**

Since our birthday, December 7, 1932—as much has happened as in twenty centuries before—it has been an era of great glory, great tragedy and of our 'greatest industrial and economic expansion . . . . In our field NORTHWEST has built a very substantial and loyal following because we have learned to do this job of metal cleaning more thoroughly than it

was ever done before. . . . . On our Twentieth Anniversary, we want to take this opportunity to thank you for this fine testimonial to our ability to solve such problems and we are going to 'leave no stone unturned' to merit your continued support. . . . . Send for twenty-four page brochure that describes all of the NORTHWEST Chemical products.

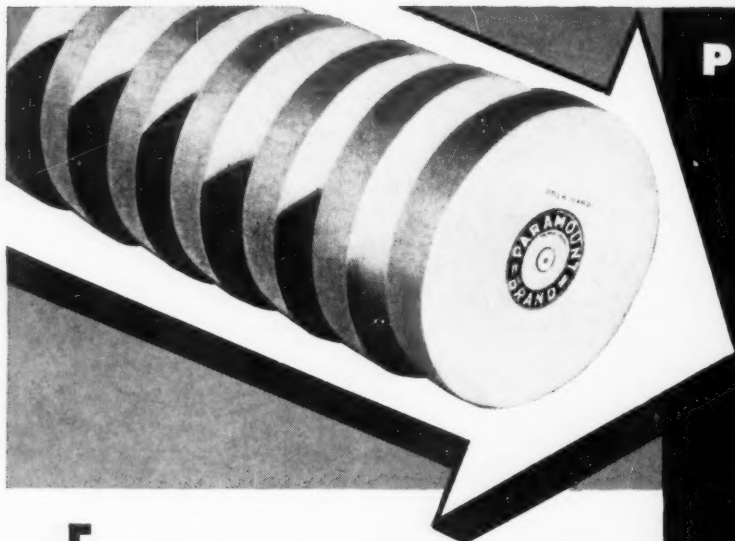


**NORTHWEST CHEMICAL CO.**  
9310 ROSELAWN DETROIT 4, MICH.



pioneers in pH cleaning control — serving you since '32





**PARAMOUNT BRAND**

# FELT WHEELS ...TOPS IN Durability

**E**ven the softest of Felt Wheels offers a durability difficult to match with any other of the commonly used fabric materials. Not only is felt tough and resistant to wear but when wear does occur, the wheel can be re-faced or re-contoured.

The net result of this durability is longer wheel life—longer useful wheel life. Try a Paramount Brand Felt Wheel of the proper hardness competitively. Check it against other wheels. We are confident it will show you greater earnings as measured by finished articles per wheel life.

## BACON FELT COMPANY

437 West Water Street

Established 1825

Taunton, Massachusetts

"America's Oldest Felt Manufacturer"

"Felt Does It Better"

Your Supply House can Furnish Bacon PARAMOUNT BRAND FELT BOBS & WHEELS



*Now Manufacturing and Selling*

**the Well-Known**

**GRIPMASTER®**

## POLISHING WHEEL CEMENT

Send orders to  
LEA Manufacturing Co., of Michigan, Inc.  
P. O. Box 3943, Strathmore Station,  
Detroit 27, Michigan  
Phone: Webster 3-5558

Inquiries and other requests to  
Dee F. Mosher  
550 South Glenhurst  
Birmingham, Michigan  
Phone: Midwest 4-9051

Through personal experience and by wide reputation, you know favorably the Lea Line of Products for Plating, Polishing, Buffing and Burring . . . products such as Lea Compound, Learok, Leabrament, Lea Liquabrade, Ad-Lea-Sive, Lea Nickel Glo, Lea Copper Glo, Lea-Clad Bright Cadmium Process, Lea Kromsavers.

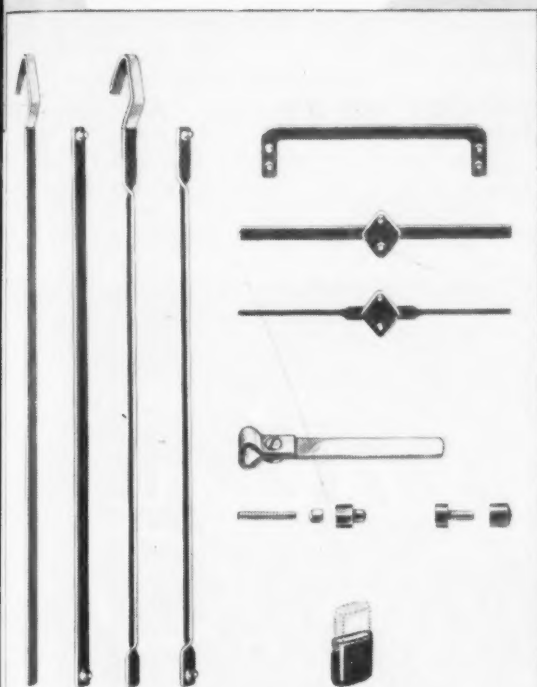
You can continue to put your confidence in GRIPMASTER Cement, now a product of Lea.

LEA . . . Burring, Buffing, Polishing, Plating and Spray Coating . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions.

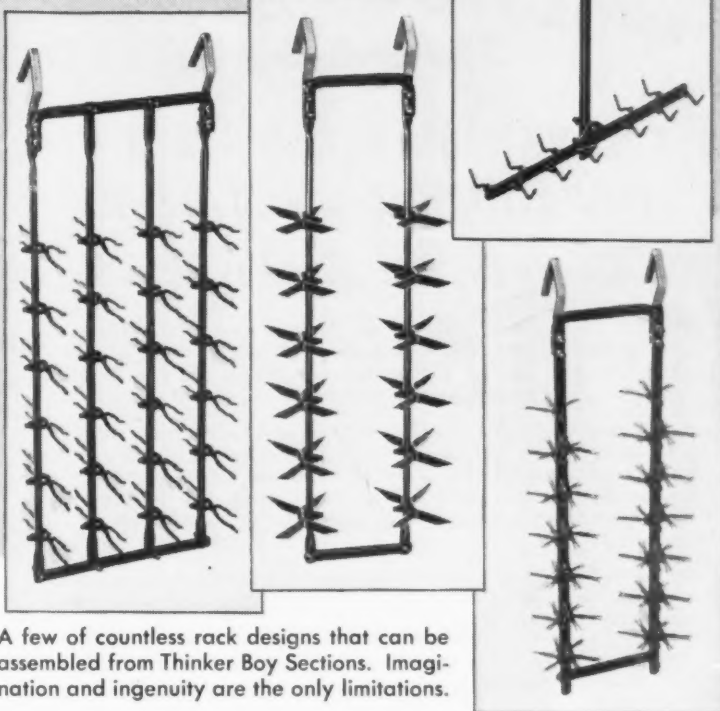
*Now* the World's largest Rack Manufacturer  
introduces

## Thinker Boy Plating Rack Sections

Enable the men who think  
to make highly efficient racks  
for any plating job  
in a matter of minutes



Thinker Boy—preformed rack sections—precoated with BELKE Universal Plastic and equipped with BELKE Vac-Seal Fittings. Assemble with a leakproof seal for quick, economical manufacture of the racks you need when you need them!



A few of countless rack designs that can be assembled from Thinker Boy Sections. Imagination and ingenuity are the only limitations.

### NO MORE WAITING!

#### No more waste and loss from inefficient Racks

Thinker Boy Sections enable you to make the racks you need **when you need them**—genuine, perfectly-formed, universal-plastic-insulated racks with removable tips. Here are a few of the many great advantages—

**Efficiency**—limited only by imagination and ingenuity.

**Complete cleaning and plating with one racking.**

**Racks when you need them**—you can be plating before your order for special racks could get to the factory.

**Standardized dimensions**—parts to match from Belke inventory.

**No coating problems**—no coating delay.

**Endless usability.** Parts can be used over and over for racks of different designs. Saves thousands of dollars in rack costs.

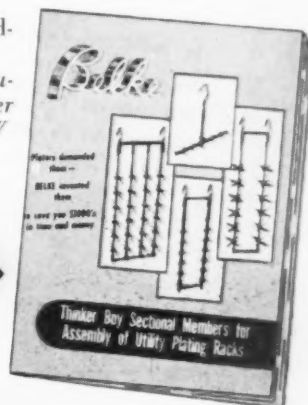
**Easy storage.** Disassembled parts take little space. Eliminates the mess of old, unused racks hanging all over the ceiling.

**Removable Tips.** Hundreds of standard types and sizes.

*New Bulletin shows how to make thousands of rack designs with Belke Thinker Boy Sections. Send for your copy NOW*

**Belke** MANUFACTURING CO.  
947 N. Cicero Ave.  
Chicago 51, Ill  
EVERYTHING FOR PLATING PLANTS

Send for  
Catalog



# Schorithene

## FLAME-SPRAYED

### CORROSION-RESISTANT POLYETHYLENE-LINED DRUMS

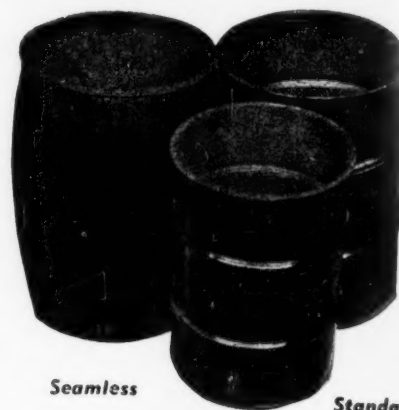
#### Better - Yet Costs Less!

Platers are enthusiastic about these new corrosion-resistant drums for operations where they formerly used breakable glassware and crocks . . . dipping, storing, plating, filtering, etc. . . . for practically any chemical used in the plant!

Schorithene is a seamless plastic lining made of polyethylene powder with the patented Schori Flame-Spray Pistol . . . the most corrosion-resistant material available today. Bonds firmly to metals, assuring long life; easy to clean. Drums coated on outside with plastic paint as protection against splash and drip.

Order Schorithene-lined drums directly from us or your distributor. See price list. Prices F.O.B. Long Island City; orders accepted from rated companies, otherwise payment with order. No COD's.

*Custom Spraying of Tanks, Pumps, Agitators, etc.  
Distributor Territories Open*



#### PRICE LIST

Gallon Cap.	Inside Diam.	Inside Height	List Cost
<b>STANDARD</b>			
3½	11"	9"	\$ 7.50
5	11"	12"	9.50
15	15"	20"	17.50
20	18"	20"	24.50
30	18"	27"	29.50
55	22"	34"	36.50
<b>SEAMLESS</b>			
30	18"	27"	40.00
50	22"	34"	52.00

Covers \$4.00 extra

### SCHORI PROCESS DIVISION

FERRO-CO CORPORATION

8-11 43rd ROAD

LONG ISLAND CITY 1, N. Y.

# Rhodium Plating

Rhodium is one of the six platinum group metals. It is hard and has an untarnishable brilliant white color. In electroplating, it produces beautiful results and is widely used for this purpose in jewelry—even precious metal jewelry. Its high reflectivity makes it excellent for mirrors for motion picture projectors and similar purposes. With restrictions upon usual plating metals, rhodium is the logical alternative for plating optical mounts, contacts for communication equipment, radar components, pen and pencil sets and a host of like objects.

**Commercial rhodium plating was developed in our laboratories.**



### BAKER & CO., INC.

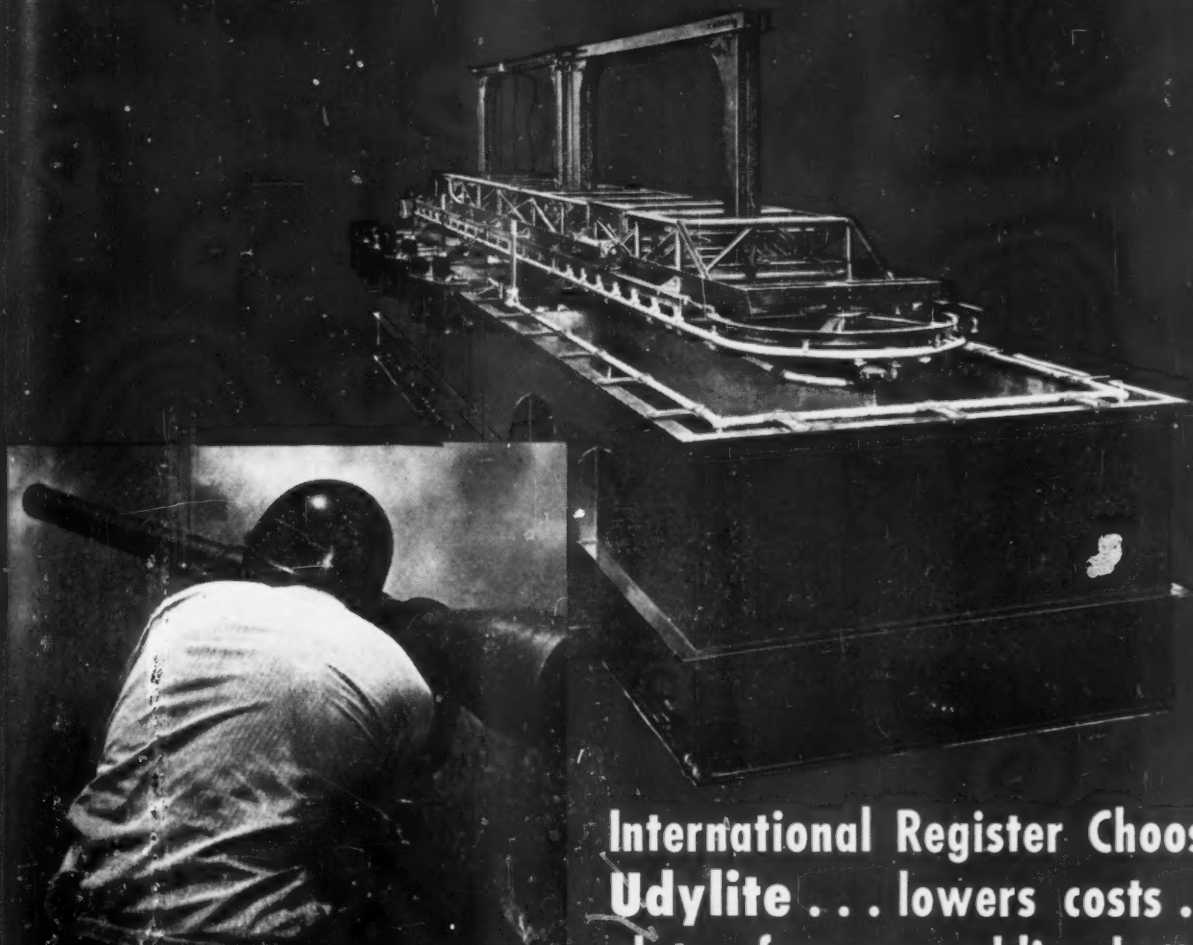
113 ASTOR STREET, NEWARK 5, N. J.

NEW YORK SAN FRANCISCO CHICAGO

Let us send you "Directions for Rhodium Plating"



# THE *Udylite* MACHINE BEHIND THE SHELL!



**International Register Chooses  
Udylite . . . lowers costs . . .  
plates fuse assemblies better!**

International Register of Chicago chose Udylite equipment to provide a tough, durable finish for vital fuse parts.

With Udylite equipment they're sure that finished fuse assemblies contain no rack marks or shadows. A special lift, which is part of the Udylite rack conveyor, raises racks clear of the plating solution so they may be easily turned.

Further proof of the effectiveness of Udylite processes and equipment is found in the fact that five other companies have ordered the same equipment to meet their requirements for similar jobs.

Udylite equipment can give *your* products the same uniform results. Call your Udylite representative today and let him show *you* Udylite short cuts to better plating. . . or write The Udylite Corporation, Detroit 11, Michigan.

THE  
***Udylite***

**CORPORATION**  
DETROIT 11, MICHIGAN

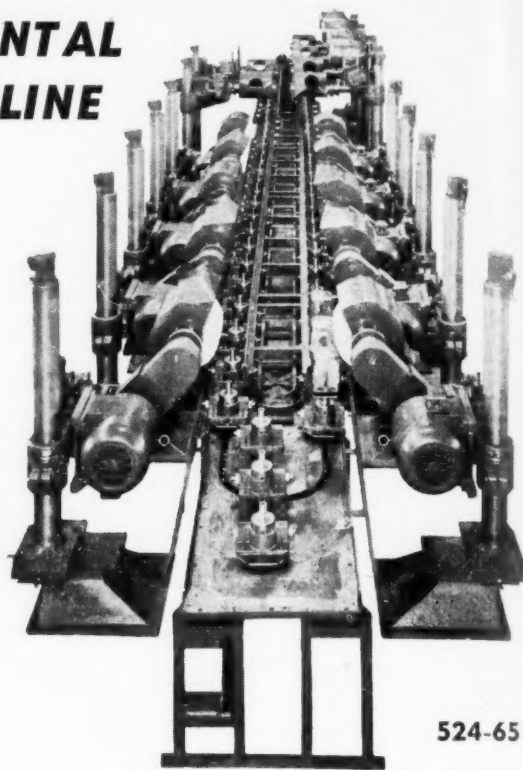
PIONEER OF A BETTER WAY IN PLATING . . .

# The **ACME** HORIZONTAL RETURN TYPE STRAIGHTLINE

*... a versatile automatic  
Polishing and Buffing Machine  
easily adaptable to a wide  
variety of work ...*

The overhead view shown is an ACME 60-ft. Horizontal Return Type Straightline equipped with 16 ACME Type G-3 heavy duty adjustable floating head polishing and buffing lathes and universal indexing fixtures and adapters. It is used for nickel buffing toaster bodies.

This type straight line is available in various lengths from 20 feet to 60 feet or more. A 10 ft. drive section and a 10 ft. chain take up section comprise the basic 20 ft. machine which will handle 4 buffing heads. Length is easily increased by adding interchangeable 10 foot sections each allowing room for 4 additional buffing heads.



524-65

CATALOG ON REQUEST

**for** CIVILIAN or DEFENSE Production  
**ACME Automatics** point the way  
to Finishing at Lower Cost....

ACME Automatic polishing and buffing machines have put finishing operations on a low cost, high production basis in many industries . . . for many years. Progressive experience and specialized attention to the solution of production finishing problems gives this organization unique qualifications to serve you. ACME Automatics have fully proved their performance on such operations as radius blending, armor plate grinding, thread clearing and automatic indexing of many operations, in addition to automatic polishing and buffing of all sizes and shapes of parts.

*For recommendations, send blueprints of part or samples before and after finishing, together with detailed information on finishing operations and production requirements. If production methods will cut your costs, we can set your job up in our experimental processing department and you can inspect the machines in operation.*

**ROTARY  
STRAIGHT LINE  
SEMI-AUTOMATIC  
AND SPECIAL  
Polishing and Buffing  
Machinery**



**ACME Manufacturing Co.**  
1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.  
*Builders* OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY



"put somethin' in the pot, boy!"

# ... and get NEW ANODES from YOUR NICKEL SCRAP

Since this advertisement first appeared in 1950, we've converted many, many thousands of pounds of nickel scrap into good oval anodes. This service of Wagner Brothers has enabled many shortage-ridden users all over the country to keep going on the ends, rods and stubs salvaged from their scrap bins. If you have any such "worthless" electrolytic nickel on your hands, why not send for a quotation. It may be just what you need — a reliable source for low-cost nickel. We'll cast your own metal, drill and tap for rods and ship to you ready for use, all within a matter of days. The cost of this service is trifling and you get full use of the pure metal you paid for originally. Our process is under strict metallurgical

controls, your assurance of maintenance of the original purity.

The volume we handle necessitates a standard ordering and shipping procedure. Please fill out coupon or write; we'll send directions and quotations on any quantity.



We have electrolytic nickel anode scrap for re-conversion.

Rods, average length \_\_\_\_\_ inches

Weight (less hooks) \_\_\_\_\_ pounds

Rods, average length \_\_\_\_\_ inches

Weight (less hooks) \_\_\_\_\_ pounds

Shipment can be handled in

☐ Strapped bundles

☐ By Rail

☐ Drums

☐ By Truck

NAME \_\_\_\_\_

TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



★★

# COPPER CYANIDE

70-71% COPPER



## Kaynide

DIVISION OF  
KRAFT CHEMICAL COMPANY INCORPORATED  
917 W. 18TH ST. • CHICAGO 8, ILLINOIS • SEeley 3-1919

**DANGER: CONTACT WITH ACID LIBERATES POISON GAS**  
Avoid breathing gas or dust. Avoid skin contact. Keep away from food or food products. Keep container closed and store in a dry place.

**ANTIDOTES - - ALWAYS HAVE ON HAND**  
**A BOX OF AMYL NITRITE PEARLS**  
(Available at drug stores)

**START TREATMENT IMMEDIATELY.**  
**CALL A PHYSICIAN.**  
Carry patient to fresh air. Have him lie down. Remove contaminated clothing but keep patient warm.

**NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON**

**IF CYANIDE GAS IS INHALED**  
Break an amyl nitrite pearl in a cloth and hold lightly under nose for 15 seconds. Repeat five times at fifteen second intervals. Use artificial respiration if breathing has ceased.

**IF CYANIDE IS SWALLOWED**  
Break an amyl nitrite pearl in a cloth and hold lightly under nose for 15 seconds. If patient is conscious or when consciousness returns give emetic and repeat until vomit fluid is clear. Repeat intervals of amyl nitrite five times at fifteen second intervals. Use artificial respiration if breathing has ceased.



**POISON  
DO NOT USE  
FOR FUMIGATION**

MFG. EXCLUSIVELY FOR THE KAYNIDE DIV. - KRAFT CHEMICAL CO. BY THE COPPER PIGMENT & CHEMICAL CORP., EAST NEWARK, N. J.

TO BETTER SERVE THE METAL FINISHING INDUSTRY

## To Brighten Your Buying Picture — A BRAND-NEW DOMESTIC SOURCE!

Yes — the pressure is off Cyanide buying! Now you can get fast shipments of a fine quality product from a new source — *produced right here in the United States by a reliable firm!* Kaynide Division, as exclusive U. S. Sales agents, can now offer you this high grade Copper Cyanide, in any quantities, for your immediate and future requirements. We repeat, this is a fine quality product — free flowing and whiter in color, uniform, its high purity carefully checked by an independent consulting laboratory.

You'll recognize the value and convenience of having this new source no further away than your Western Union buzzer or the end of your telephone. Naturally, prices are competitive. Why not place a trial order right now?

### DISTRIBUTORS:

*We are building complete national coverage for KAYNIDE Copper Cyanide and other products for the finishing trade. A few good territories are still open . . . your inquiries are invited.*

★★ **WRITE TODAY** for prices and shipping  
information, analysis



## Kaynide

DIVISION OF KRAFT CHEMICAL COMPANY, INCORPORATED  
917 W. 18TH STREET, CHICAGO 8, ILLINOIS . . . SEeley 3-1919

### Kaynide

offers a complete chemical  
service to Finishers.

Available for immediate  
shipment:

**Potassium Cyanide**  
**Sodium Cyanide**  
**Zinc Cyanide**  
**Silver Cyanide**  
**Gold Cyanide**



No job is too big or too intricate for Manhattan. If your tank is too big for a railroad car, why not consult us, perhaps we can come into your plant and line it. Manhattan has rubber lined some of the world's largest, and most intricate, tanks and equipment. However large or complex, you are sure of a permanent bond of rubber to metal despite expansion and contraction under temperature changes, or knocks of ordinary usage • Protection of your capital investment means protection of steel equipment from corrosion . . . protection of process fluids from contamination . . . protection from dangerous stray currents in plating . . . with Manhattan rubber lining. Let Manhattan handle your next job.

RUBBER LINING PLANTS AT PASSAIC, N. J., AND NORTH CHARLESTON, S. C.



MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY  
**RAYBESTOS - MANHATTAN, INC.**



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks  
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HERE AT *"Agile"*  
YOU WILL FIND



**EXPERT ADVICE** on the use of our new outstanding construction materials for anti-corrosive applications.

**AGILENE** (Specially Selected Grades of Polyethylene for highest corrosion resistance.)

**AGILIDE** (A new, completely unplasticized Polyvinyl chloride, insuring high structural strength and excellent resistance to corrosion.)

**AGILEST** (A series of glass reinforced Polyesters for highest structural strength and high chemical resistance.)

### EXPERT ENGINEERING

We have the required knowledge to design and fabricate according to your specifications:—

Containers and Tanks, both are self-supporting structures and liners for steel, concrete and wood tanks; pipe lines and pipe installations, apparatus and equipment, such as exhaust hoods and systems, reaction vessels, acid pumps, valves, etc.

We invite your inquiries and will be pleased to furnish you literature, prices, delivery, etc. for fabrications built to your own specifications, as well as on sheets, tubing, ducting, etc.



*American Agile Corporation*

Plant and General Offices • 5461 Dunham Rd., Maple Heights, Ohio  
Mailing Address, P. O. Box 168 • Bedford, Ohio

## The **RIGHT** Service for You is... **MILLER SERVICE**

### The **RIGHT** Facilities

The name Miller on a product means quality, means manufacturing skill and volume production resources unique in the field of finishing materials.

### The **RIGHT** Men

The name Miller means engineering leadership, dependability in performance backed by good service. It means experience and "know how" at your call.

### The **RIGHT** Products

The name Miller on a product is the positive symbol of sound investment; the tops in quality; the last word in performance, results and economy.



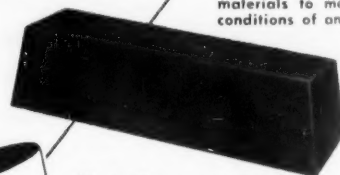
**Miller Buffs**  
A complete range of type and grade for all requirements.



**Buffing Compounds**  
The most outstanding line of compounds ever offered.



**Polishing Wheels**  
Tailor made from all materials to meet all conditions of any job.



Next time you need materials or methods investigate the complete line of Miller Equipment and Supplies. Miller products are **PROFIT ENGINEERED**. Miller Technical Service is geared to your requirements.

Call in a Miller Finishing Engineer

**J. C. MILLER COMPANY**

631 Chestnut Street, S. W. • GRAND RAPIDS, MICHIGAN

ARE YOU USING LIQUIMATIC?

METAL FINISHING, December, 1952



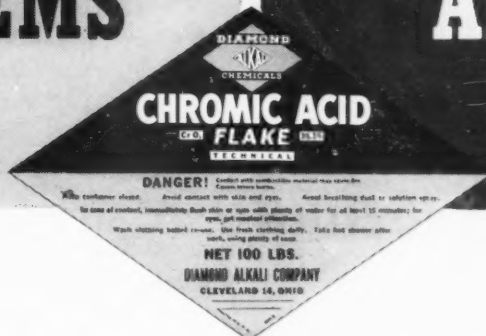
*Chemicals you live by*

# 3

## PROBLEMS

# 1

## ANSWER



The familiar yellow, red and black diamond on your chromic acid drum means the solution to these plating room problems:

**Technical problems**—DIAMOND Technical Center can help you unravel knotty problems of production and quality control.

**Delivery problems**—Now you can get as much chromic acid as you want, when you want it. Our policy of insuring ample

supply through increased production has seen to that.

**Quality problems**—You have none, with DIAMOND Chromic Acid, because DIAMOND controls *every* step in its production.

To fill your chromic acid needs, and for help with any plating room problems, call your nearby DIAMOND sales office, or write us direct in Cleveland.

### DIAMOND CHROMIC ACID

DIAMOND ALKALI COMPANY...CLEVELAND 14, OHIO



# POLYKOTED DRUMS

POLYETHYLENE COATING by a NEW PROCESS\*

## SPECIAL

LIQUID TIGHT LIDS  
WITH FLEXIBLE  
POLYETHYLENE  
OUTLETS ALSO  
AVAILABLE.

## USE FOR

- DIPPING
- PICKLING
- RINSING
- MIXING
- STORAGE



\*Pat. Applied For.

## WHAT ARE THEY?

Polykoted Drums are standard steel drums coated with acid and alkali resistant polyethylene by a new process developed by Polykote, Inc. (pat. applied for) which eliminates the possibility of pinholes or solution spots inherent in the customary manner of coating with polyethylene by either flame spraying or solution coating. The coating comes applied in thicknesses of  $\frac{1}{8}$ " (standard) and  $\frac{1}{4}$ " (double-thickness).

## WHO USE THEM

Polykoted Drums have been in use for over two years by hundreds of major industrial plants and platers in this country, Canada and South America.

## WHERE TO BUY THEM

Contact your nearest Plating Supply House or the Manufacturer at the address below.

Send for our Free Table of Resistance of Polyethylene to Chemical Attack.

**POLYKOTE, INC.**

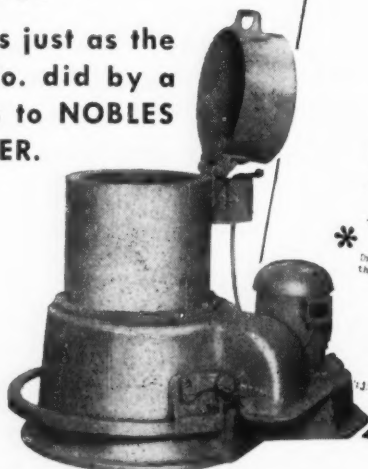
446 Genesee St., Buffalo 4, N. Y.

## NOBLES CENTRIFUGAL DRYER increases production 200%\*

You can get results just as the  
Warsaw Plating Co. did by a  
simple conversion to NOBLES  
CENTRIFUGAL DRYER.

### Features

- SAFETY COVER
- SEALED CHAMBER
- CAST BASE
- COMPACT
- AIR EXTRACTOR
- EXPANDING BRAKE
- SEALED BEARINGS
- REVERSIBLE MOTOR



Write for more information.

**NOBLES ENGINEERING & MANUFACTURING CO.**  
745 EAST THIRD ST. ST. PAUL 6, MINNESOTA



# How to Determine Impurities in Copper Plating Baths

**SILVER** in copper plating baths may be determined colorimetrically, by using a carbon tetrachloride solution of dithizone to produce the colored solution. The hue measured is that of the mixed color of silver keto dithizonate and cupric keto dithizonate. Small amounts of certain other metals do not interfere, nor is separation of the silver required.

**CHLORIDE**, also, may be determined colorimetrically. The method depends upon the addition of a known quantity of silver ions and determining the excess of silver ions remaining after silver chloride has been precipitated. The excess is determined by the mixed color of silver and cupric dithizonate.

**LEAD** traces are determined as follows: Organic material is oxidized with phosphoric acid and the lead is separated from interfering ions by extracting with a carbon tetrachloride solution of dithizone in the presence of potassium cyanide. Transmittance of the solution is measured and the quantity of lead determined from a calibration curve.

**CHROMIUM:** To determine chromate chromium, nitric acid is added to oxidize any reducing agents, phosphoric acid is added to make a complex with  $\text{Fe}^{+++}$ , and diphenylcarbazide is added to form a colored complex. Transmittancy of the solution is measured, and the amount of  $\text{CrO}_3$  present as chromate is read off the calibration curve.

For total chromium analysis, iron is first removed by precipitation. The chromium is oxidized first by fuming with perchloric acid and then by boiling with ammonium persulfate in the presence of silver ions. The

silver is precipitated. The solution is centrifuged, the transmittancy of the clear supernatant solution measured, and the amount of  $\text{CrO}_3$  present is determined from the calibration curve.

**NICKEL** can be accurately determined colorimetrically by forming nickel dimethylglyoxime but copper must first be removed quantitatively.

## A.E.S. RESEARCH PROGRAM

The American Electroplaters' Society is conducting a comprehensive research program and has developed useful information on current plating problems. International Nickel, in addition to its other support of this program, feels that it will be a further service to make copies of these A.E.S. Research Reports available.

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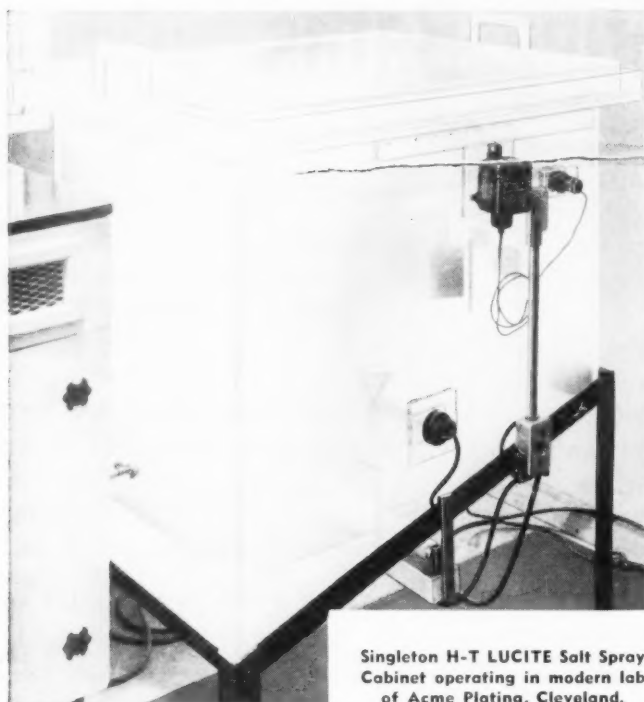
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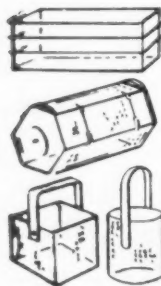
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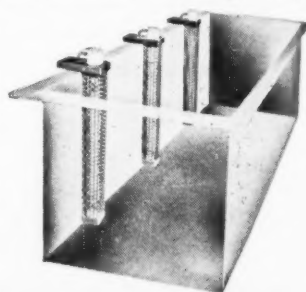
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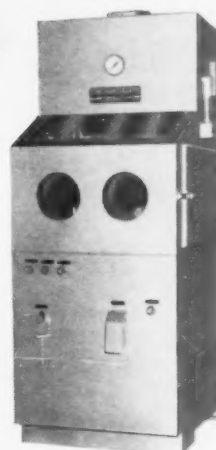


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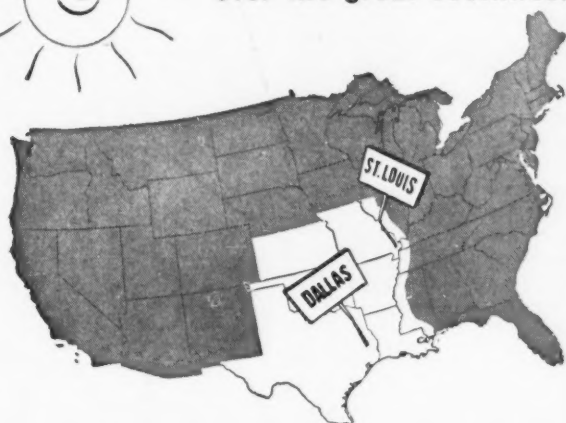
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